A COMPARATIVE STUDY OF THE EFFICACY AND ADVANTAGES OF LAPAROSCOPIC REPAIR OF UMBILICAL AND PARAUMBILICAL HERNIAS OVER CONVENTIONAL OPEN REPAIR

DISSERTATION SUBMITTED FOR THE

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CERTIFICATE

This is to certify that the dissertation entitled **"A COMPARATIVE STUDY OF THE EFFICACY AND ADVANTAGES OF LAPAROSCOPIC REPAIR OF UMBILICAL AND PARAUMBILICAL HERNIAS OVER CONVENTIONAL OPEN REPAIR "** is a record work done by **Dr.JOEL DANIE MATHEW,** under my direct supervision and guidance during the period of March-September 2016.

This has been submitted in partial fulfillment of the award of M.S. Degree in General Surgery (Branch I) to The Tamil Nadu Dr. M.G.R. Medical University, Chennai 600 032.

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DECLARATION

I, **Dr. JOEL DANIE MATHEW** solemnly declare that the dissertation titled **"A COMPARATIVE STUDY OF THE EFFICACY AND ADVANTAGES OF LAPAROSCOPIC REPAIR OF UMBILICAL AND PARAUMBILICAL HERNIAS OVER CONVENTIONAL OPEN REPAIR "** is a bonafide work done by me in the Department of General Surgery at Government Rajaji Hospital during the period of March 2016 to September 2016.

I also declare that this bonafide work or a part of this work was not submitted by me or any other for any award, degree and diploma to any university, board either in India or Abroad. The dissertation is submitted to The Tamilnadu Dr.M.G.R. Medical University, towards partial fulfillment of requirement for the award of **M.S**. **DEGREE IN GENERAL SURGERY (BRANCH** I).

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CONTENTS

INTRODUCTION

A hernia is classically defined as an abnormal protrusion of an organ or tissue through a defect in its surrounding walls. The word hernia is derived from the Greek word 'hernios' meaning 'a bud'.

Any protrusion through the abdominal wall with the exception of hernia through the inguinofemoral region is defined as ventral hernia. Incisional hernia and primary defects in abdominal fascia which can cause umbilical and paraumbilical hernias,epigastric hernia and spigelian hernia are grouped under ventral hernias.

Abdominal wall hernias are common with a reported prevalence of approximately 1.7% for all ages and almost 4% in the population aged 45 years and over.

Umbilical and paraumbilical hernias account for approximately 5% of all primary hernias. Approximately 90% of adult umbilical hernias are acquired rather than due to the persistence of infantile umbilical hernias. Often in adults,the hernia does not occur through the umbilical scar but is a protrusion through the linea alba,just above or sometimes just below the umbilicus,the so-called paraumbilical hernias.

Predisposing factors to umbilical and paraumbilical hernias include any condition resulting in increased intra-abdominal pressure such as obesity, multiparous women, ascites and intra-abdominal malignancy and as such the incidence is reported to be upto five times more in females compared to males. Biomechanically the umbilical

zone is naturally weaker because it allows more transverse stretch and hence the reason for the hernias.

Both these types of hernias have received little attention in comparison with other types of hernias of the abdominal wall. The technique described by Mayo in 1901 is the classic method for umbilical hernia repair, consisting of "vest-over-pants" imbrication of the superior and inferior aponeurotic segments. Currently, this technique is infrequently used. For parietal defects smaller than 3 cm in diameter, a primary closure is the preferred technique for most surgeons. For defects larger than 3 cm, a repair with prosthetic material similar to the technique for incisional hernias is recommended.

The Laparoscopic technique for Umbilical hernias and Paraumbilical hernias repairs has resulted in decreased postoperative pain and length of stay, shorter RTNA(Return To Normal Activity), and lower recurrence rates. The large surface area of the mesh allows substantial tissue ingrowth for permanent mesh fixation, and the intraabdominal pressure tends to hold the mesh in place against the underlying structures. The main differences compared with the open technique are the smaller incisions and minimal soft tissue dissection needed for the placement of a large mesh overlap, which decreases the incidence of wound complications.

The laparoscopic approach affords the surgeon the ability to clearly and definitively define the margins of the hernia defect and to identify additional defects that may not have been clinically apparent preoperatively. One of the key determinants to a high

recurrence rate following conventional open repairs is the phenomenon of occult hernias which are effectively circumvented in the laparoscopic approach.

AIMS AND OBJECTIVES

Aim of the study

To Compare the outcomes of Laparoscopic repair of Umbilical and Paraumbilical hernias(both primary closure and mesh repair) over the conventional open techniques used routinely.

.**Primary Objectives:**

1. To derive conclusions about the **Advantages of Laparoscopic closure of the defect in Umbilical and Paraumbilical Hernias over the conventional open Repair involving both primary suturing and Onlay Mesh Technique** with respect to the Shorter RTNA,lesser risk of infections, less complications, less incidence of recurrences and long term outcome.
2. To derive conclusions about the selection of surgical techniques of repair in selected scenarios.

REVIEW OF LITERATURE

The umbilicus represents a midline opening in the linea alba and is one of the potential weak areas of the abdomen and a relatively common site of herniations. Umbilical hernia occurs when the umbilical scar closes incompletely in the child or fails and stretches in later years in the adult patient. The hernia becomes readily apparent once the abdominal contents move through the umbilical opening given the relative lack of soft tissue in the anterior body wall at the site of the umbilicus.In the adults,however,most of the clinically detected umbilical hernias would be paraumbilical hernias which are usually detected only during the time of the surgery.

Umbilical hernias have been documented throughout history with the first references dating back to the ancient Egyptians with the first known record of a surgical repair by Celsus in the first century AD. The ebers papyrus ,from approximately 1500 BC detailed the use of truss .the observations in this papyrus are " when you judge a a swelling on the surface of the belly ..... what comes out .....caused by coughing ."Umbilical hernias were first described in the first century ,but only in 1740 William Cheslden reported the first repair.

Mayo in 1901 reported the first series of patients to undergo the classic overlapping fascia operation through a transverse umbilical incision using non-absorbable sutures.

Estimates of umbilical hernia present at birth have a wide range. In Caucasian babies, the incidence has been reported at 10-30%, although for unknown reasons it may be several times greater in African-American children. Umbilical hernia is even more

common in premature infants of all races and there is a tendency for familial inheritance.

The majority of congenital pediatric umbilical hernias are known to close over time, as the infant becomes a child. In this way, by school age, only 10% of umbilical hernias remain open on physical examination. Umbilical hernia repair in the child is therefore rarely performed electively before the age of 2 years, and incarceration in the child is rare. Current recommendations in the pediatric surgical literature advise the delay of umbilical hernia repair until at least 3 years of age given the likelihood that most umbilical hernias will spontaneously close in the young child.

The incidence of umbilical hernia in the adult is largely unknown but most cases are thought to be acquired rather than congenital. It is known to occur more commonly in adult females with a female:male ratio of 3:1. Umbilical hernia is also more commonly found in association with processes that increase intra-abdominal pressure, such as pregnancy, obesity, ascites, persistent or repetitive abdominal distention in bowel obstruction, or peritoneal dialysis. The etiology of umbilical hernia in the adult may be multifactorial, with increased intra-abdominal pressure working against a weak or incomplete umbilical scar.

Elective repair for an umbilical or paraumbilical hernia is one of the most frequently conducted gastrointestinal surgical procedures worldwide. The repair technique for an umbilical or paraumbilical hernia can be open (sutured repair or mesh repair) or laparoscopic depending on the surgeon's appraisal, expertise, and the size of the hernia defect. Even though evidence-based guidelines regarding laparoscopic ventral

hernia repair techniques exist , the choice of repair technique is not always based on scientific evidence and by many referred to as a “tailored approach”. Although, the operation is regarded as a minor surgical procedure there is little consensus, especially in small umbilical hernias (≤2 cm), on the optimal repair technique.

Conventionally,the open methods of repair are being done in this regard but laparoscopy has been catching up and has become a trendsetter in current practice in the management of ventral hernias including umbilical and paraumbilical hernias. Laparoscopic repair for ventral hernias has become increasingly popular due to its minimally invasive technique. The laparoscopic technique is potentially with less risk of surgical site infection, shortened convalescence, and comparable risk of recurrence compared with open repair.

This thesis aims at bringing out the efficacy and advantages of the laparoscopic repair over conventional technique of open repair of umbilical and paraumbilical hernias both from the patients’ and surgeons’ perspective.

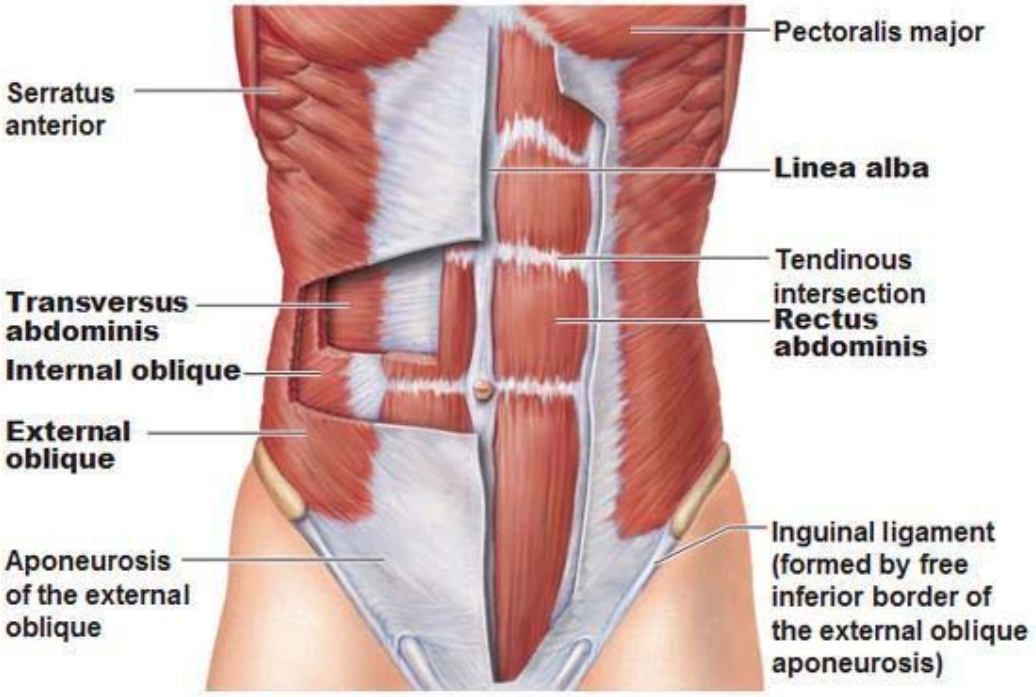
ANATOMY OF ANTERIOR ABDOMINAL WALL AND THE UMBILICUS

The anterior abdominal wall is a comples musculoaponeurotic structure which has attatchments to the ribs superiorly,with the vertebral column posteriorly and the bones of the pelvis inferiorly.The blood supply ,lymphatic drainage and the innervations bears proof to the segmental development of the anterior abdominal wall.The strength of the abdominal wall is the most important factor determining the occurrence of ventral hernias.

Anterior abdominal wall consists of nine layers .These are as follows :

1) Skin
2) Subcutaneous tissue
3) Scarpa's and Camper's fascia
4) External Oblique muscle
5) Internal Oblique muscle
6) Transversus abdominis muscle
7) Transversalis fascia
8) Extraperitoneal adipose tissue
9) Peritoneum.

Ventral hernias develop when there is a weakness in the anterior abdominal wall which can be due to a number of factors. Consequently each of the repair measures are aimed at correcting these factors which are responsible for the development of the same. Their significance increases manifold while recurrent hernias are taken into account.



ANATOMY OF THE ANTERIOR ABDOMINAL WALL

In the mid-line of the abdomen layers of rectus sheath and the muscle are replaced by a thick cord of connective tissue, forming the linea alba, which, at the umbilicus, may reach 1 cm in breadth. The umbilical scar contains four fetal structures:

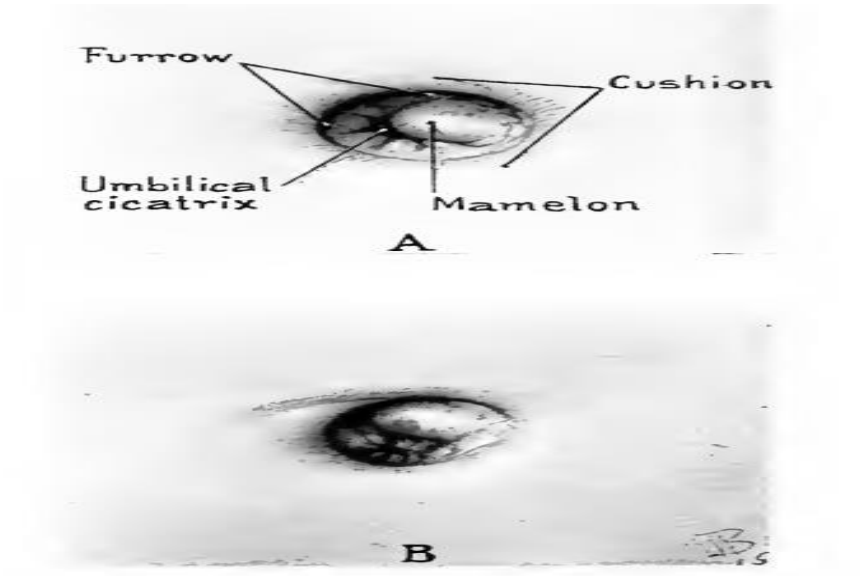
(1) the umbilical vein, which passes to the liver along the suspensory ligament;

(2) and (3), the umbilical arteries, passing downward and outward to the bladder;

(4) the urachus, which passes to the bladder.

ANATOMY OF UMBILICAL REGION

The typical umbilicus presents a circular cushion or base,which forms the elevated outer margin of an area showing a hollow, from the bottom of which arises an elevation which Catteau calls the mamelon . Situated in or near this elevation is the umbilical scar. Between the mamelon and the umbilical cushion is a definite furrow. The umbilicus is a depression in the skin, at the bottom of which is concealed the cicatrix left by the throwing off of the cord. This cicatrix is drawn inward by the retraction of the umbilical vessels and of the special tissue which surrounds them (Wharton's jelly).



Normal umbilicus according to Catteau

The base, cushion, or umbilical hollow is open in front and continuous with the skin of the abdomen in something like 18.75 per cent of the cases. When the surrounding skin inclines gradually toward the umbilical depression by a gentle slope, no prominence can be distinguished. In such cases we are dealing with an umbilicus without cushion. More frequently the base of the umbilical depression is surrounded by a circular elevation, a veritable cutaneous cushion. In about 6 per cent of the cases this cushion is complete and forms a uniform elevation, completely surrounding the cutaneous orifice of the umbilical depression. Ordinarily it is incomplete and occupies only a portion of the circumference of the umbilicus; for example, half of the circumference, the superior or inferior, or one of its lateral walls. This cushion then takes the form of a halfmoon, a crescent, etc., and gives rise to numerous varieties in the appearance of the umbilicus.

The bottom of the umbilical depression, despite Catteau's description, is not always occupied by an eminence carrying the cicatrix.

(a) A smooth depression: the bottom absolutely smooth, without any trace of elevation or mamelon. In these cases the umbilical depression was also regular and infundibular in form. They observed two varieties : In the first the umbilical orifice may be large, widely open, presenting at its extreme bottom the cicatrix, smooth or depressed, and having a stellar or linear aspect; in the second the opening is narrow, and one has to separate the folds in order to see the cicatrix which occupies the bottom of the depression.

(b) The mamclon or elevation: In about two-thirds of the cases the bottom of the umbilical depression is occupied by an eminence or mamelon. The form of the eminence shows an infinite variation: sometimes—and this is the rule—it is single, sometimes double, occasionally triple. When the mamelon is double, the two elevations may be juxtaposed, so that a vertical or median depression separates them. When superimposed, the superior elevation is separated from the inferior by a small transverse depression. Usually, however, when the mamelon exists, it is single.

(c)The umbilical cicatrix occupies the bottom of the umbilical depression when the latter is smooth. In the umbilicus with a mamelon in the depression it occupies sometimes the central point; at other times it is on one side of the mamelon. The cicatrix may be punctiform and hardly visible; at other times it is linear and branches in different directions. It may be vertical or more frequently transverse. Sometimes it has a stellar arrangement with a variable number of branches.

(d) The walls of the umbilical depression may present as many variations as the other elements constituting the umbilicus. These variations are chiefly dependent on the depth of the umbilical depression, which itself depends upon the degree of development of the subcutaneous adipose tissue. Hence we find an explanation of the fact that a deep umbilicus is more frequent in women and in stout people

The umbilical cavity varies in size and in form. It can readily be understood that the degree of depth of the umbilical depression, the presence or absence of the central mamelon, and the larger or smaller opening at the base of theskin, will modify entirely the form and dimensions of the cavity of the umbilicus.

There are certain facts worthy to be noted about some of the aspects of umbilicus which can point towards the possible aetiological factors regarding the development of herniations in and around the umbilicus in the paediatric and adult population,namely :

(1) The umbilicus in the colored race is usually larger than that in the white race. This may be due to the fact that the negro's skin is thicker than that of the white,or possibly to the lack of proper medical attention during labor, resulting in a larger scar.
(2) The umbilicus in the infant is much larger in proportion to the body weight than is that of the adult.
(3) There is no definite relation between the size of the adult and the size of the umbilicus. A small person may have a large umbilicus, and vice versa.

(4) In the adult the depressed umbilicus is far more frequent than the elevated or button-shaped type.

(5) The button is the infantile form.

(6) A large umbilicus of the horizontal type is associated with a wide linea alba,also with diastasis of the recti abdominis muscles. Diastasis of the recti is especially pronounced in infants and children. It is also found at the end of pregnancy when it may lead to the formation of a small hernia.

(7) The linea nigra in a multipara may be in the mid-line or bilaterally displaced at the umbilicus.

(8) The umbilicus of a multipara is, as a rule, more wrinkled, and the periumbilical skin more relaxed in character than in a nullipara

(9) Except for the growth of hair around the navel in the adult male, there are no sexual differences between it and the navel in a nullipara.

(10) Obesity has a tendency to produce the funnel-shaped umbilicus which is prone for weakness.

HISTOLOGIC APPEARANCE OF THE UMBILICUS

As pointed out by Hertz and others, the umbilical pit is at first covered over with squamous epithelium, but is devoid of papillae. Later the epithelium is identical with that of the outer skin. The scar, however, is usually lacking in sebaceous or

sweat-glands. According to Hertz, Pernice was able to detect in three infants the remnants of the omphalomesenteric duct in the scar, it being recognized as a canal lined with cylindrical epithelium.

UMBILICAL HERNIA : CLASSIFICATION

Umbilical hernias are classified into three categories according to the age of presentation :

1 . Congenital type, also known as the Omphalocele .

2 . The Infantile Type

3 . The Adult Umbilical Hernia

OMPHALOCELE

It is also known as exomphalos ,it is a midline defect ,the herniated viscera is covered by a membrane.

The layers are :

1 . The Peritoneum on the Inside

2 . Wharton’s jelly

3 . Amnion outside

The umbilical vessels insert over the membrane and not on the abdominal wall .the defect may be in the upper,mid or low abdomen.

Abdominal wall is formed by the infolding of the cranial ,caudal and two lateral embryonic folds .the intestines due to their rapid growth migrate outside the abdomen at about six weeks of gestation ,and normally return back into the abdomen in 10 -12 weeks of gestation .

In exomphalos, these intestines do not return to their original position and stay out of the abdomen.Different organs ranging from the intestines, liver and spleen may lie outside.

When these are associated with anterior diaphragmatic hernia ,sternal cleft ,pericardial /cardiac defect it is known as **PENTOLOGY OF CANTRELLL** .When exomphalos is present in the lower abdomen may be associated with bladder or cloacal exstrophy .It may also be associated with trisomy of 13,14, 15, 18 , 221 and also Beckwidth – Widemann syndrome ,and Hurler syndrome.

Incidence is about 3 per 10000 live births, and male to female ratio is equal .

Omphalos is also associated with GERD ,cryptorchidism, musculoskeletal disorders and neural tube defects.It is easily identifiable by prenatal ultrasound at the second trimester of pregnancy .

Treatment options varies with the size of the defects and associated congenital malformations:When the baby has severe pulmonary hypoplasia ,closure of the abdomen is impossible and wound is taken care of by topical antibiotics,until the wound epithelizes and the subsequent hernia is treated afterwards .

Smaller defects are closed primarily ,the umbilical vessels are ligated and neoumbilius can be created .Large or giant omphalos may be treated with short term\long term silos and staged closure can be done after six weeks using skin flaps.

Omphaloceles have normal gastrointestinal function but are associated with severe congenital malformations hence survival rate is around 60 % only.

INFANTILE UMBILICAL HERNIA :

Umbilical hernia in children is usually congenital ,and is the most common umbilical disorder in infants and children .They usually close before one year of age .They are more common in babies of African descent .

Studies have shown that fibrous proliferation around the umbilical ring occurs as late as 2 to 3 years and after that the rate of spontaneous closure decreases greatly .The rate of centripetal contraction in the defect of the umbilicus is as much as 16 % of the area of the defect per month .

Strapping of the umbilicus relieves the parents' anxiety but is not of much value .The prognosis for the supraumbilical hernia to close spontaneously is poor ,but after the ambulation of the child the rate of closure of all umbilical hernias increase.

Most of the umbilical hernias close spontaneously by the age of one year and 90 % resolve by 5 years .The hernia protrudes only when the baby cries and this condition is not painful and strapping of the umbilical hernia should be avoided since it may cause allergy and skin breakdown .

Surgical treatment for umbilical hernia in this group demands only when symptoms like incarceration ,strangulation ,or rupture occur.

HERNIA OF THE UMBILICAL CORD :

This should be differentiated from infantile umbilical hernia .

This is herniation of the bowel into the umbilical cord and bowel loops lie at the base of the umbilical stump and may be prone for injury by the umbilical clamp.This is essentially a small omphalocele and should be closed as soon as possible.

ADULT UMBILICAL HERNIA :

Umbilical hernia is a frequently encountered problem in clinical practice but is infrequently discussed in the medical literature .

EMBRYOLOGY :

The body stalk and the ductus –omphalo-entericus together with the umbilical coelom are enveloped by the amnion and the umbilical cord is formed .two membranes of the amniotic cavity come in contact ,the two extra embryonic mesoderm fuses .the embryo flexes and the amnion encircles the structures in the umbilical cord .The umbilical cord around eight weeks is short and thick enclosing the following structures:

1 .The Ductus –Omphalo –Entericus

2. Two Vitelline Vessels

3 . The Umbilical Coelom

The extra embryonic coelom is connected to the intra embryonic coelom by the umbilical coelom .Further devolpment of the amnion ,leads to the lengthening of the umbilical cord .

The structures which degenerate are:

1 . The Omphalo – Enteric Duct (it can remain in the form of meckel ‘s diverticulum)

2 . The Umbilical Vesicle (forms the medial umbilical ligament lying medially in the adults)

3 . The Extra Embryonic Vitelline Circulation

4. The Umbilical Coelom

Finally only the body stalk remains (2 arteries and 1 vein) with the coverings of amnion layers.The connective tissue of the amnion forms the so called ‘wharton ‘s jelly’ made largely from mucopolysaccharides .

After the delivery of the baby ,even in the absence of external interventions ,umbilical cord physiological occlusion occurs after birth by the collapse of the wharton’s jelly and vasoconstriction of the vessels .

A natural clamp is created ,halting the flow of the blood .Within the baby the umbilical vein closes up and degenerates into the round ligament of the liver ,and the ductus venous closes up and degenerates into the ligamentum venosum .

The umbilical artery partially closes up degenerating into the medial umbilical ligament ,and the remaining parts are retained as a part of the circulating system .

After the birth ,the remaining end of the umbilical cord shrivels and dries off leaving behind a healthy and healed umbilicus in about 7 to 10 days in a healthy term neonate .During this process any contamination or **sepsis may lead to umbilical sepsis and formation of umbilical hernia later on in the adult life.**

LAYERS OF THE UMBILICUS :

Layers of the anterior abdominal wall namely

1. Subcutaneous layer of fat
2. Superficial fatty layer of fascia camper
3. Deep membranous layer of scarpa

All these layers are fused together in the region of the umbilicus ,and the surrounding deposition of the fat makes the umbilicus look like it is depressed.

PATHOPHYSIOLOGY OF UMBILICAL AND PARAUMBILICAL HERNIA :

Pathophysiology in infantile umbilical hernia is that usually the obliterated umbilical vein which forms the round ligament of the liver typically attaches to the inferior border of the umbilicus thereby providing strength to the umbilicus. In 25 % of the infants this round ligament of the liver attaches to the superior border of the umbilicus thereby leaving the inferior border composed of only peritoneum and umbilical fascia leading to weakness and formation of infantile umbilical hernia .

Pathophysiology in adult umbilical hernia varies in the sense ,too much intrabdominal pressure can cause umbilical hernia formation .

Abnormal decussation of fibres in the linea alba can also lead to the devolpment of umbilical hernia in adults .

In adults ,the umbilical hernia does not seem to be related to the persistent juvenile umbilical hernia since only 10 % of the patients report childhood herniation .Hence the adult umbilical hernia is an acquired herniation through the umbilical canal due to increased abdominal pressure .

The fusion of the ectoderm and the embryonic mesoderm ,forms a fascial defect for the passage of the umbilical vessels.After birth the thrombosis of the vessels occur ,thereby promoting the contraction of the umbilicus by cicatrisation and hence the weakest area in the umbilicus is the area between the umbilical vein and the superior end of the umbilical ring. This weakness is due to the relative absence of elastic fibres in the umbilical vein.In adults the margins of the umbilical canal is umbilical fascia

from the behind ,linea alba from the front and medial edges of the rectus sheath from the side.

AETIOLOGY AND RISK FACTORS

1 . **Low birth weight** :

Umbilical hernia is a very common problem in babies with low birth weight. 80% of infants weighing less than 1200 gm have a certain amount of transient umbilical hernia when compared to other babies , due to prematurity of the umbilical ring .

2 . **Trisomy 13/Patau syndrome :**

Occurs in 1 in every 10000 births.Newborns have cleft lip /palate ,umbilical / inguinal hernia ,severe mental retardation ,seizures ,single palmar crease and polydactly .

3 . **Trisomy 18/Edward Syndrome :**

More common disorder ,affecting girls more than boys ,occurs in one in every 3000 live births .Newborns present with rocker–bottom feet,,microcephaly ,pectus carinatum ,VSD , mental retardation ,recti diastasis and umbilical hernia.

4 .**Trisomy 21/Down's Syndrome :**

It is the most frequent viable chromosomal disease ;occurs in 1.5 of every 1000 live births .Presentation is with microcephaly ,brushfield spots in iris ,clinodactly of fifth finger ,saddle toe ,VSD ,umbilical hernia and duodenal atresia .

5 . Congenital Hypothyroidism :

Congenital thyroid hormone deficiency ,occurs in 1 in every 4000 live births ,which if untreated can lead to growth failure and mental retardation .They present with excessive sleeping ,poor muscle tone ,larger anterior fontanelle ,exaggerated jaundice ,umbilical hernia and macroglossia .Umbilical hernia is due to poor muscle tone .

6 **. Mucopolysaccharidoses**

MPS 1 also known as Hurler‘s syndrome ,which has deficiency of L – iduronidase enzyme .They stop devolping at the age 2 to 4 years .These babies may have inguinal or umbilical hernia .They also have distinct facial features (bulging forehead ,depressed nasal bridge).

7 **. Marfan’s syndrome**

Marfan‘s syndrome affects one in 5000 live births . It is an autosomal dominant disorder of the connective tissue .Structures in the body like the blood vessels ,ligaments ,joints are supported by the connective tissue . These structures are weakened and the joints and heart are affected . Many of the patients have umbilical and diaphragmatic hernia.

8 . **Beckwidth – Widemann Syndrome**

Also known as overgrowth syndrome,the growth is asymmetrical and the pattern is known as hemihyperplasia .Many of the patients have omphalocele and umbilical

hernia and have macroglossia , visceromegaly and hypogylcemia.Beckwith – widemann syndrome is present in 1 in every 12000 live births .

9 **. Umbilical sepsis**

Umbilical sepsis or omphalitis occurs in the newborn period.Babies who are premature and subjected to prolonged birth are at a higher risk for omphalitis .Most commonly caused by bacteria such as Staphylococcus ,Streptococcus and Escherichia coli .

This infection in an early age can cause delayed closure of the umbilical ring and cause umbilical hernia .

10. **Obesity**

Obesity can cause increased build up of abdominal pressure against the abdominal wall .Children and adults who are obese have a more significant risk of devolping umbilical hernia than those counterparts who are normal in height and weight .Excess fat infiltration into the muscles causes weakness of the abdominal muscles and leads to the devolpment of umbilical hernia .

11. **Smoking**

Smoking is the main reason for a person to devolp COPD in whom chronic coughing leads to increased intraabdominal pressure which can lead to development of umbilical hernias .

Excessive smoking can lead to decreased collagen synthesis and cross linking ,alters the extracellular matrix causing weakness leading to development of hernias .

12 . **Multiple Pregnancies**

Umbilical hernias are more common in multiparous women due to the fact that mutiplie pregnancies causes weakness of the abdominal wall and each pregnancy causes increased intrabdominal pressure .Subsequent pregnancies only increase the risk of umbilical hernia .

13 . **Fluid In The Abdomen (Cirrhosis With Ascites)**

There is a 10 % increased risk for patients having liver disease with ascites to devolp hernias ,most commonly umbilical hernias .Nowadays spontaneous rupture and leakage of ascitic fluid in uncommon in these patients . Since the complications such as strangulation in these patient pose a significant risk ,surgery is indicated and has good prognosis provided the hepatic function is good .

14 . **Increased Intrathoracic Pressure (COPD ,Bronchial Asthma)**

As said earlier increased intrthoracic pressure causes devoplment of umbilical hernia in these patients,and is the main cause of recurrence if left untreated.

CLINICAL FEATURES OF UMBILICAL AND PARAUMBILICAL HERNIAS :

a) SWELLING :

Umbilical hernia usually presents as a swelling at or near the umbilicus ,in babies it is usually evident while the baby cries ,coughs and strains . It may disappear when the baby lies down.

In adults the swelling is obvious ,the swelling may increase in size while bending ,coughing and may reach bigger sizes if left untreated .

Often in adults,the hernia does not occur through the umbilical scar but is a protrusion through the linea alba,just above or sometimes just below the umbilicus,the so-called paraumbilical hernias.

b) PAIN :

Umbilical hernias are painless in children

In adults in both umbilical and paraumbilical hernias,patients may feel a dragging type or pricking type of pain occasionally .The reasons of the pain are not clearly known ,but may be due to the adhesions in the abdomen .

Only when the umbilical hernia becomes larger in size acutely,they become distorted and then develop severe pain with abdominal distension and vomiting.These ominous signs herald the onset of strangulation or incarceration in the patient and should be attended to as early as possible .

Umbilical hernias are more notorious for incarceration ,strangulation and obstruction than other hernias due to a relatively narrow neck .

INVESTIGATIONS

There is no need for definite investigations for diagnosis of umbilical and paraumbilical hernias since it is a straightforward clinical diagnosis. But certain investigations are necessary to prepare the patient for surgery and for the treatment of underlying intercurrent diseases which are the predisposing causes for the formation of hernia.

Preoperative investigations include:

1) Blood - Hb%
2) Total count, differential counts Erythrocyte sedimentation rate
3) Blood group Blood sugar Liver function tests.
4) Urine: Albumin; Sugar; Microscopy
5) Chest and abdomen X-ray,Ultrasound, CT

DIAGNOSIS

Umbilical hernia presents no difficulty in diagnosis.On examination of the patient both supine and standing positions and increasing the abdominal tension by having the patient elevate the head from the bed or asking the patient to cough will render the hernia visible and enable the clinicaian to palpate. The contents and neck can be palpated.

Cough impulse would be present unless there is obstruction and incarceration.

DIAGNOSTIC IMAGING IN THE EVALUATION AND MANAGEMENT OF UMBILICAL AND PARAUMBILICAL HERNIA

In most cases correct diagnosis can be reached on the basis of history, symptoms, and clinical examination.

Ultrasound investigations, which are part of our standard routine,merely confirm the clinical findings in the majority of our patients.There are two groups of patients for whom ultrasonography is particularly valuable.

1. Patients, especially obese people, with palpable masses within deep layers of the abdominal wall.

2. Patients with pain and complaints located within the abdominal wall or the umbilical region but without causative clinical findings.

Most cases ultrasound is the method of choice, but in some cases,computed tomography (CT) or magnetic resonance imaging (MRI) may be helpful.

SONOGRAPHY

It Is performed with the patient in the supine position and upright position.Sucutaneous tissue, rectus sheath, muscles, fascial and vessels are identified.Under observation of the questionable dynamic examinations are performed

with valsalva's maneuver (by coughing or by pressing down on the abdomen).

Pre operative examinations

- Diagnosis of hernia, types of hernia.
- Differential diagnosis to the surgeon for the correct surgical treatment.
- Undetermined palpable masses of the abdominal wall.

Sonographic criteria for hernias:

- Fascial gap with protruding hernial contents.
- Intestinal structures are characterized by peristaltic movements and air bubbles.
- Omentum appears as stationary, highly reflective, space occupying structure.
- In addition after mesh repair for hernia, a recurrence can occur at the edge of the mesh.

Sonographically there is no discontinuity of the aponeurosis or fascial gap. All muscle layers of abdominal wall are present but appear thinner in comparison with the unaffected side in case of paraumbilical hernias.

Post operative investigations

1. Hematoma
2. Seroma
3. Abscess

4. Hematoma of the Rectus sheath.

COMPUTED TOMOGRAPHY

CT is an excellent method for evaluating the abdominal wall and its relations to the abdominal viscera. CT becomes the modality of choice in obese patients after surgery. It can be useful in demonstrating the condition of bowel loops.To achieve the highest diagnostic accuracy,it is recommended to use Valsalva's maneuver and oral radio paque material. CT is also used to differentiate post operative findings such as hematoma, abscess, or recurrence of hernia after laparoscopic repair of ventral hernias.

VARIOUS SURGICAL TECHNIQUES OF REPAIR OF UMBILICAL AND PARAUMBILICAL HERNIAS

The pathogenesis and hence the management of both umbilical and paraumbilical hernias are the same.So though the techniques are mainly described pertaining to repair of umbilical hernias,the same principles apply to the management of paraumbilical hernias as well since the distinction and definitive diagnosis are essentially made only intraoperatively.

In utero ,umbilicus has a vital role,but after birth it has only minimal significance .The umbilical cord may be used for venous acess after birth ,and the umbilical artery and umbilical vein may be used for catherisation by the neonatologists .

The umbilicus may be frequently affected by sepsis- a term known as omphalitis .

The psychological part of the umbilicus has been studied , in persons where the umbilicus has been removed surgically.

Umbilical hernia is a frequently encountered problem by the surgeons in the past , present and the future .

The various techniques of the repair of the umbilical and paraumbilical hernias are discussed in detail below:

MAYO TECHNIQUE :

William James Mayo M .D , F.A.C.S., (June 1861 – July 1938) was a surgeon in the united states of America .He earned his degree in the University of Michigan in the year 1883.He devolped the classical " VEST OVER PANTS TECHNIQUE " for the umbilical hernia repair .

This well known technique goes back to 1895 ,is still performed and is known as the Mayo's operation .

Mayo was the first surgeon to perform vertical overlapping technique to repair umbilical hernia .He overlapped the adjacent aponeurotic structures .

The technique of overlapping aponeurotic structures vertically , the "vest over technique " secured a wide area of adhesions .

The results of the mayo studies were published in the year 1901 and 1903 .In this study he had done about 25 repairs,all with good results and no recurrence.The conventional technique of Mayo's Operation is still being done all over the world not only for the repair of umbilical hernias but also for the repair of epigastric hernias and incisional hernias.

Schumpelick and Kingsnorth has explained the mayo operation ,which is as follows:

The abundant skin over the hernia sac is excised and the abdominal wall is cleared all around the defective fascia .

The hernia sac is cleared from the fibrous coverings.The contents of the sac is inspected after the opening of the sac.Any adhesions or scar tissues between the abdominal viscera is carefully dissected .

The steps explained above detail the steps of the standard exploration ;now the standard Mayo's Operation is explained as below:

STEP 1 :

The peritoneum is closed continuously with a absorbable suture so as to prepare the defect for the overlapping technique .

STEP 2 :

The overlapping fascia is cleared of the underlying peritoneum from its attachements.

STEP 3 :

The doubling of the fascia begins 3 cm from the overlay fascia with nonabsorbable sutures with a loop taken in the underlay fascia .

STEP 4 :

The free margin of the overlay fascia is fixed with nonabsorbable sutures to the abdominal wall .

STEP 5 :

Lastly , to reduce the tension relaxing incisions are made over 5 cm from the suture lines on the rectus sheath or the aponeurosis .

This technique almost revolutionized the hernia repair in the first half of the century and inspired the surgeons all over the world.However this surgical technique has not lived upto the promise and only few randomised trials are there in the world .

The recurrence rate after Mayo ‘s repair is somewhere between 20 % to 28 % .

This technique has lost its upper hand and many surgeons do not follow this operation but still it is practised in many parts of the world .

In the fifth edition of Nyhus and Condon’s hernia David Benett writes that the classic Mayo ‘‘vest-over pants’’ technique had one major fault in that the bursting strength of the wound was directly impaired to a degree proportional to the overlapping and tension.

Benett's opinions were :

To suture a defect primarily with nonabsorbable suture with edge to edge repair and for prosthesis repair in case of a large defect and not to create a new umbilicus as it increases the chance of recurrence.

UMBILICAL AND PARAUMBILICAL HERNIAS WITH PRIMARY SUTURE REPAIR :

STEP 1 : THE INCISION :

Skin is prepared and sterile drapes are applied and a curvilinear incision is placed either over the umbilicus or below the umbilicus ;This incision may be hidden under the abdominal wall .The incision should not extend beyond 180 % .

STEP 2 : DISSECTION OF THE SAC :

After the subcutaneous tissue is incised the bleeding points are cauterised .A dissection plane is created between the subcutaneous tissue and the hernia sac which leads to the defect in the rectus sheath .

The dissection is carried out all around the hernia sac both in the upward direction and downward direction till the sac is encircled.The sac is cut off from the umbilicus such that a buttonhole is not created which increases the chance of infection and umbilical necrosis .

The dissection is carried out to a variable distance so that the closure of the fascia does not distort the periumbilical skin .

STEP 3 : OPENING OF THE SAC :

After the sac is cleared of its fibrous covering ,the sac is opened and the contents are inspected and reduced accordingly .

The excess sac is excised and the defect is closed with a nonabsorbable or absorbable suture according to the size of the defect and patient .

For youngsters and children the size used is 2-0 and 3-0 is used for infants and children .

STEP 4 : SIMPLE UMBILICALPLASTY :

The umbilicus is maintained in inverted position by fixing the undersurface of the umbilicus to the fascia of the abdomen and the excess periumbilical skin may be fixed to the fascia additionally by interrupted absorbable sutures .

STEP 5 : CLOSURE :

A fine absorbable suture may be used to close the dermis,and absorbable sutures are used to close the skin to avoid post surgical site infection. Some paediatric surgeons may use colloidon dressings in infants and some advocate pressure dressings to avoid post operative seroma or hematoma formation.

OPEN REPAIR TECHNIQUE WITH MESH (ONLAY, SUBLAY ,INLAY):

These surgeries can be usually done under spinal anaesthesia as it provides good relaxation .

General anaesthesia in the form of inhalational anaesthetics can also be used for infants and smaller children .

PREPARATION :

The patient is placed in a supine position in the operating table .The skin is prepared all around the operative field and the umbilicus is cleaned thoroughly and cotton swabs with antiseptics may be necessary to reach the deep crevices of the umbilicus.

INCISION AND EXPOSURE :

The most common incision used is a curved “smiley” incision around the umbilicus superiorly or inferiorly ,so that the umbilicus is retained in the skin flap .In the case of large hernias a vertical incision may be necessary .

The sac is easily separated from the adjacent structures by a combination of both sharp and blunt dissection ,and the dissection where the sac is attached to the umbilicus is carefully carried out since overenthusiastic dissection will result in a post operative umbilical necrosis and may lead to mesh infection and disastrous complications .

The neck of the sac is clearly dissected all around the level of linea alba and rectus sheath.The contents of the sac would be mostly omentum ,but frequently the small bowel and large bowel may also present as the contents .Usually the omentum in chronic long standing hernias may form adhesions between the sac and omentum thereby preventing the reduction of the sac .

Sharp dissection is often required to release the adhesions between the sac and if there is a strong suspicion of gangrenous bowel ,the peritoneal cavity is opened through a midline incision and the bowel is well inspected and resected or reduced according to the demand of the situation.

Sometimes it is wise to clamp and divide the incarcerated omentum ,and reducing it after ligation into the peritoneal cavity .When the contents have been reduced,and the sac and defect well defined ,excess sac is cut and the defect is closed with a non absorbable suture either No.1 Prolene or No.1 Ethilon .

When the size of the defect approaches more than 3cm ,primary closure techniques have a higher rate of recurrence hence most surgeons prefer mesh hernioplasty . The placement of the mesh should be such that the mesh overlaps the defect by atleast 3 to 5 cm all around .

The plane posterior to the defect and the posterior rectus sheath is being preferred by some surgeons .When the plane between the peritoneum and the posterior rectus sheath is freely dissected ,surgeons after confirming that the

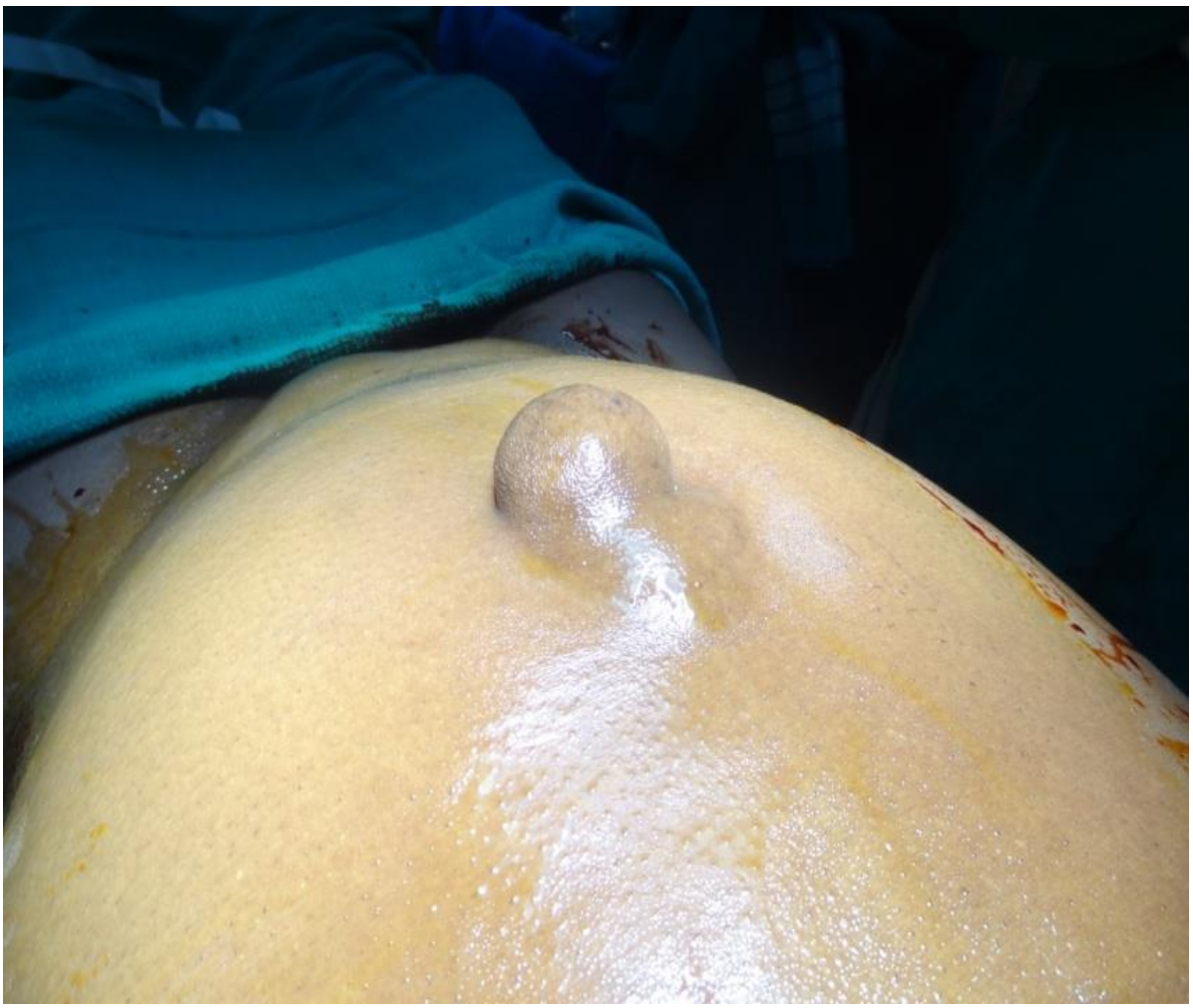
omentum is not attached directly behind the umbilical hernia would place the Polypropylene mesh .

If this plane could not be reached ,alternatively the mesh can be placed in an intraperitoneal position.A dual sided mesh is placed wherein the nonadherent smooth surface containing the PolyTetraFluroEthylene (PTFE) side is made to face posteriorly facing the bowel and omentum thereby preventing the formation of post operative adhesions later.The other side containing the Polypropylene is kept facing towards the peritoneum and the abdominal wall .

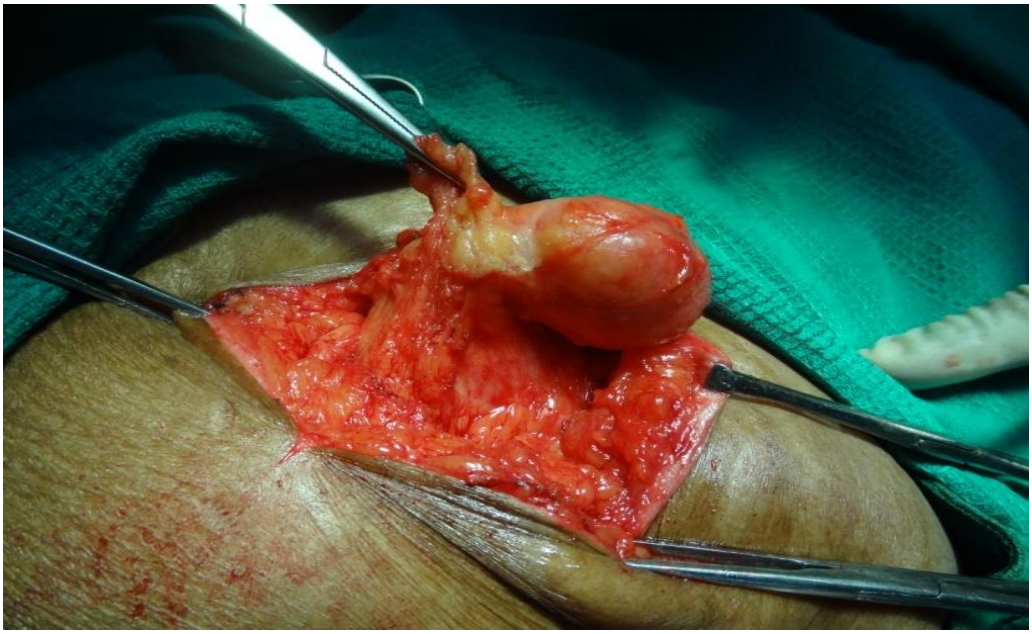
The mesh should be placed such that it extends about 3 to 5 cm all around the defect and it is fixed to the abdominal wall by full thickness sutures through the linea alba taking care not to take the Polytetrefluroethylene side so that there is no possibility of catching a loop of bowel . After achieving complete hemostasis ,the umbilicus is inverted by fixing its undersurface skin to the linea alba .If the hernia is large ,a closed sialastic suction drain is used through an adjacent stab incision and the scarpa's fascia is closed.

UMIBLICAL HERNIA OPEN REPAIR WITH ONLAY MESH :

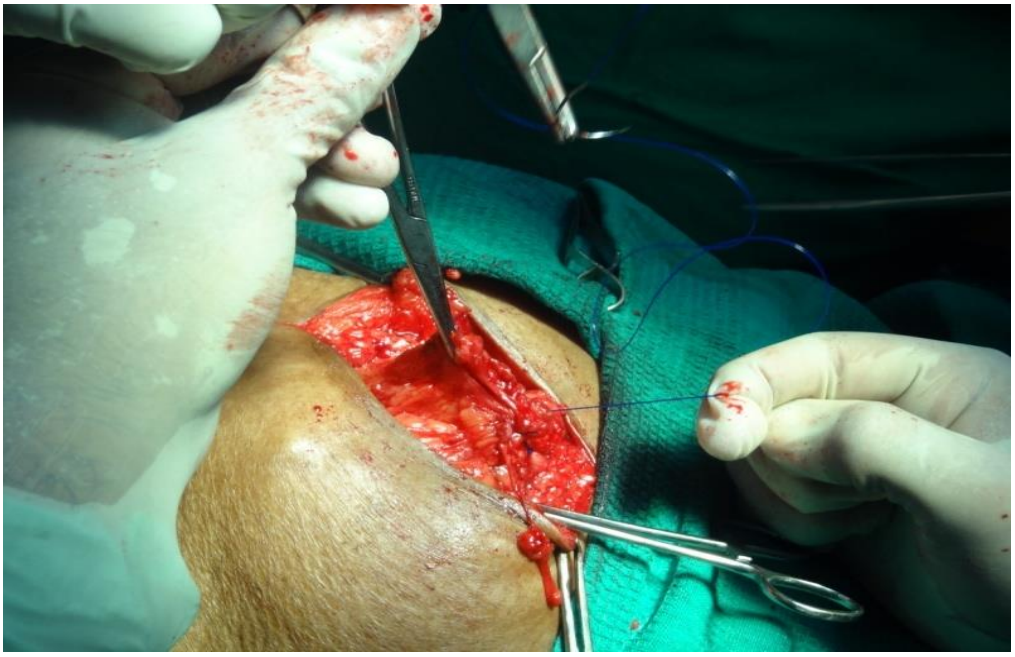
PREOPERATIVE PICTURE :



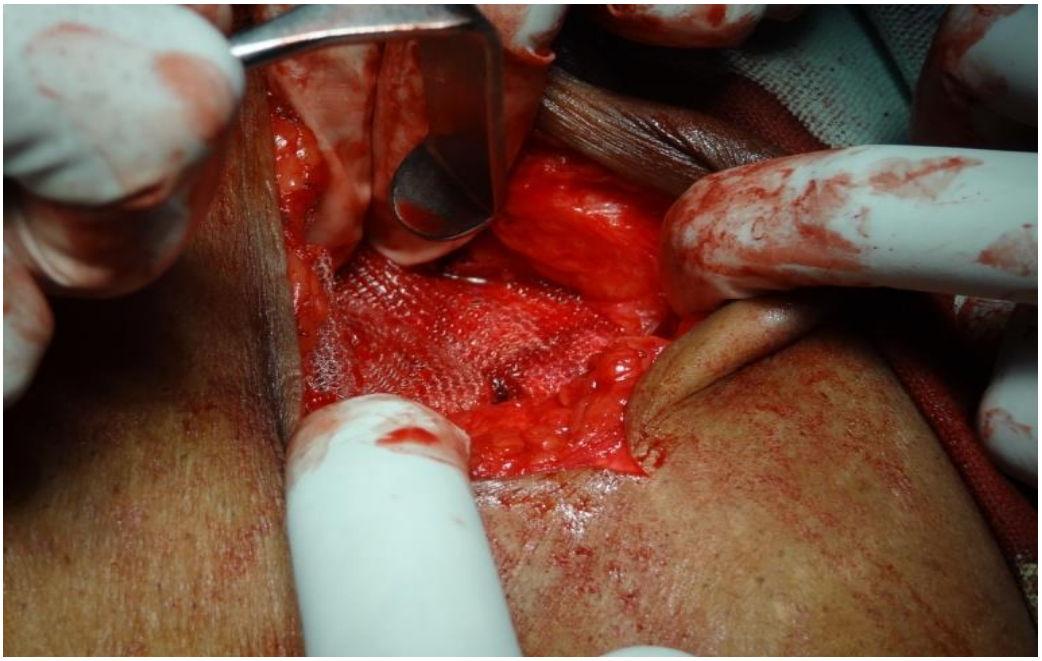
DISSECTION OF THE SAC :



REDUCING THE CONTENTS AND CLOSURE OF THE DEFECT



ONLAY MESH REPAIR :



FIXATION OF THE UMBILICUS :

COMPLICATIONS OF OPEN UMBILICAL HERNIA REPAIR :

The invention of prosthetic mesh has brought about a change in the outlook of hernia surgeries , since it has been thought that the prosthetic mesh would decrease the incidence of recurrences .It rapidly gained global acceptance and popularity for its wide range of uses .

Now there is a rapid increase in hernia repair after the introduction of the mesh But the prosthetic mesh has its own pitfalls ,and a number of complications have been reported after the use of meshes some of which have been discussed below:

1 .SEROMA FORMATION :

A seroma is a loculated collection of fluid that sometimes occur after surgery,especially after prosthesis repair.It may occur after repair of large hernias .

Some persons ,perceive that the seroma is a body ‘s reaction to a foreign body to encapsulate it .The fluid that collects may come from the injured blood vessels that leak plasma or from the dying or injured cells due to inflammation .

They usually develope in the first week ,and they may be a concern to the patient evoking a possibility of recurrence . The incidence may vary from 1 % to 35 %.

The reasons for a seroma formation are :

A .Wide dissections ,

B . Excessive use of electrocautery ,

C . Use of sharp suction cannulas ,

D . Excess of skin excised

E .Potential space after repair of large hernias .

The disruption of vascular and lymphatic channels may be the reasons for seroma formation and use of drainage catheters may prevent it.Physical examination may show a compressible swelling at the site of surgery .

Other techniques such as quilting sutures,tension closing sutures and preserving the fascia above the external oblique and rectus sheath may prevent the formation of seromas.

Seromas are more uncomfortable and less likely to cause pain.Ttreatment options may include aspiration ,sclerotherapy , placement of drainage catheters and excision of seroma cavity .Aspiration may be avoided and only done when the seroma persists for a longer period since secondary infection may be introduced inadvertently.

2 . MESH INFECTION :

The first use of prosthetic mesh was by Usher in 1950 for inguinal hernias .Since then numerous advances have been made in the mesh technology for the repair of various type of hernias .Prosthetic mesh can induce various

types of changes in the body such as foreign body reaction ,calcification, thrombosis and infection .

An ideal mesh should be easy to handle ,inert ,provide adequate strength ,resist contraction and infection ,should not resist patients' function and be simple and cheap to manufacture.In a recent study the incidence of infection and other complications were studied for different types of meshes and it was found out that **the multifilament polyester mesh resulted in a higher rate of complications than the monofilament or woven polypropylene type of mesh .**

PORE SIZE AND MESH INFECTION

Based on the pore size,the meshes can be broadly divided into four categories :

TYPE 1 : totally macroporous mesh (pore size > 75 microns)

TYPE 2 : totally microporous mesh (pore size < 10 microns)

TYPE 3 : macroporus mesh with multifilamentous or microporous components

TYPE 4 : submicronic pore size (these type of mesh are not suitable for prosthesis implants)

Pertaining to meshes, the fibre diameter and fibre number which relates with the strength are of significance as is the pore size too .In general micropore sized mesh are more prone for infection and developement of seromas while

erosion and adhesion formation are more associated with macropore sized mesh .

In a micropore mesh the pore size is 10 lm hence the bacteria can easily enter but the leucocytes which are bigger in size (75 lm) cannot enter ; hence the bacteria are easily protected from the human body's defense mechanisms and infections follow.

Macropore meshes also allow a rapid ingrowth of three dimensional collagen fibre network .

MICROORGANISMS

The most common organisms causing mesh infection belong to the following groups :

Staphylococcus spp (staphylococcus aureus) most common pathogen

Streptococcus spp (group b streptococci)

Gram negative bacteria (enterobacteriaceace)

Anerobic bacteria (including peptostreptococci spp).

Candidal and Mycobacterium spp rarely causes any mesh infections in patients. Psuedomonas aeroginosa is also a rare pathogen isolated from ICU settings in mesh infection, particularly in diabetic patients and immunocompromised individuals.

Usually these pathogens are seeded from the skin contaminants infecting the wound during the procedure .Once infected, the mesh infection poorly responds to antibiotic therapy .

CLINICAL SIGNS AND SYMPTOMS :

The average time interval between a hernia repair and the onset of infection was found to be two weeks.There may be signs of inflammation such as erythema ,swelling at the site of mesh placement and systemic symptoms like fever..The patients may present with high grade fever ,chills and rigors .It may also present like sinus or abscess.

PREVENTION :

The surgeon should minimise the amount of mesh used since the mesh is a foreign body and an ideal place for bacterial colonisation.Hence the most important issue is the amount of mesh used as per the various studies conducted.

In addition four approaches are suggested to decrease the rate of infection.These are as follows:

1 . The irrigation of the field with an antibiotic containing solution intermittently till the closure of the wound has shown to decrease the rate of bacterial contamination of the mesh and their growth .

2 . Use of a material which releases antibiotics slowly can be used . Collagen impregnated with Gentamycin has been tried of late.These are fixed infront of the mesh to the aponeurosis .

3 .The mesh may be impregnated with a antibiotic to decrease the rate of infection .

4 . The use of Intravenous antibiotics before surgery have been shown to decrease the rate of infection especially when a prosthesis is involved .

DIAGNOSIS AND TREATMENT :

The clinician should strongly suspect a mesh infection when patients present with an unexplained fever or inflammatory symptoms after surgery at the site or at the site of surgery even when presenting with unusual symptoms such as abscess or enterocutaneous fistula .

Imaging studies such as Ultrasonography and Computed Tomography may be used which can demonstrate inflammation of the subcutaneous fat surrounding the mesh of different density from that of a seroma .They may also demonstrate an abscess or a fistula .This again put emphasis on the fact that no diagnostic aspiration of seromas should be done since there is a dangerous possibility of introduction of microorganisms into the seroma risking a mesh infection inadvertently.

The therapy of mesh infection is a combination of medical and surgical management . Monotherapy with antibiotics are of no use or has poor

outcome.The microorganisms in response to the prosthesis induce a fibroblastic response which produces a thick capsule around the mesh which subsequently defer the penetration of antibiotic agents .This is especially true in case of Staphylococcus aureus which produces a biofilm which deters the penetration of antibiotics and host immune response .

When infection is not controlled by medical management ,the only therapy is surgical removal of the mesh and nowadays studies indicate that this varies according to the type of mesh used .When a polypropylene or polyester mesh is used antibiotics and drainage alone may be used but the mesh should be removed in case of a polytetrafluoroethylene mesh .

When there is persistent fever or discharge from the site ,incomplete removal of the mesh should be considered.

RECURRENCE :

Recurrence most commonly occurs at the mesh –fascia interface but less commonly due to the intrinsic failure of the mesh material. Technical failure and failure to identify the correct plane are the commonest reasons for recurrence . The mesh is to be placed below the arcuate line in the preperitoneal space such that the mesh and the fascia adherence should be atleast 4 cm so that according to the Pascal ‘s principle of hydrostatics it promotes fibroblast proliferation and ingrowth due to pressure apposition principle .

It has been demonstrated that the prolene mesh may shrink 30 % after implantation.When the mesh is placed intraperitoneally it provides a better anchorage and the abdominal wall provides a secure and physiological repair.Recurrences in this type of repair is reported to be less than 10 % and this intraperitoneal inlay technique is being used routinely for both open and laproscopic surgeries all over the world.

LAPROSCOPIC TECHNIQUE OF REPAIR OF UMBILICAL AND PARAUMBILICAL HERNIAS

The patient is placed in a comfortable supine position . General anaesthesia in the form of inhalational anasthetics may be used .An intravenous antibiotic is infused and monitors are placed on both side of the table .The abdomen is decompressed by a nasogastric tube and the skin is sterilised and draped .

Hasson's open technique or the Modified Scandinavian technique is being used to enter into the peritoneal cavity to create pneumoperitoneum by creating the camera port.Alternatively,Veress needle can also be used to produce the pneumoperitoneum .It is usually introduced at the palmer's point .Palmer's point is a point 3 cm below the left costal margin at the level of the left mid clavicular line .This is the area where there is less likely chance of intrabdominal adhesions .10 mm and additional 5 mm ports may be used the alternative sites are right and left iliac fossa and right hypochondrium .A 30 degree telescope is introduced in the 10 mm port .Thorough laproscopy is done

to rule out any pathology and if there is no contradiction the surgery is proceeded with reduction of the incarcerated contents from the defect .

Once the contents are reduced the size of the defect is measured using a spinal needle transabdominally since we may overestimate the size when there is pnuemoperitoneum .Any additional hernias are noted.To reduce the wrong estimate of the size of the hernia, the insufflation pressure is kept to a minimum of 8 to 10 mm of Hg.

Laparoscopically there are mainly 2 methods of repair of umbilical and paraumbilical hernias.

1) Laparoscopic Suture Repair(LSR)
2) Laparoscopic repair with prosthesis or tissue grafts.Most commonly used is the mesh prostheses(LRWM)

   The choice of whether to go for a primary suture repair of prosthesis is tailored to the patient.

   In primary suture repair with the help of 1 Ethilon and with or without using a cobbler's needle through and through sutures are taken across the defect to cover it.

In mesh repair,the undersurface of the defect is cleared of the fat for the placement of the mesh .The defect is closed by nonabsorbable sutures , a suture passing instrument such as ski needle is used to pass the suture transabdominally and the suture is taken out the abdomen and tied at the subcutaneous level . Atleast three sutures are used to closed the defect .This

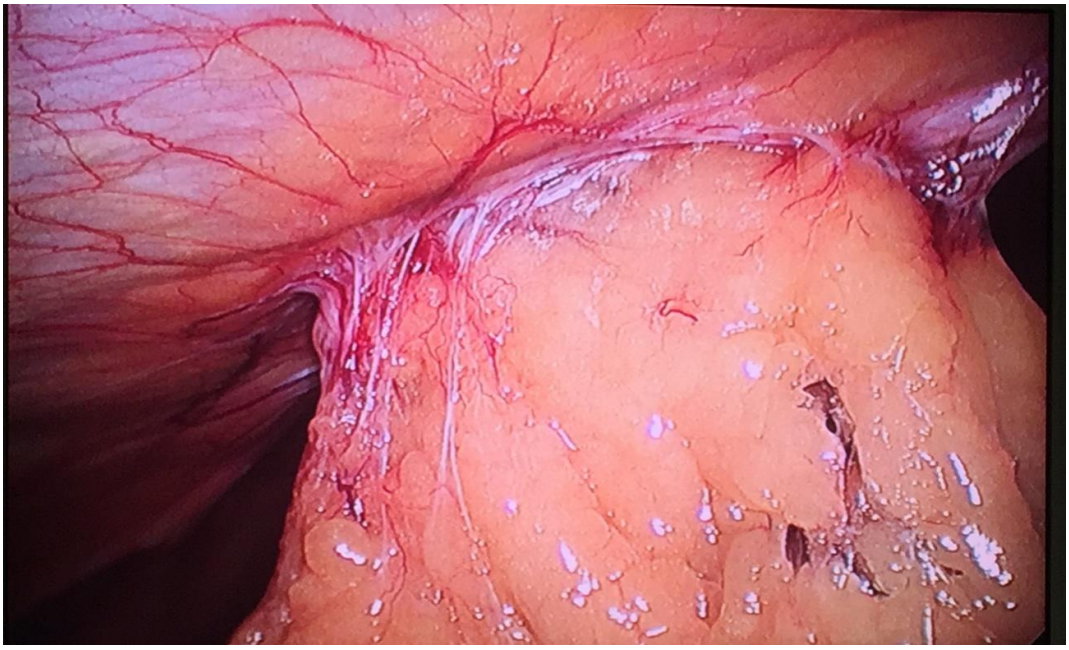
technique was previously used by Carter to close 10 mm trocar sites and this technique only takes 5 to 10 min additionally to the procedure .

We use proceed mesh to cover the defect. Atleast 3 cm overlapping should be used .Three to four sutures of 1 Ethilon or 1-0 prolene are used around the corner of the mesh and the mesh is rolled and inserted into the abdominal cavity .The mesh is unrolled in the abdominal cavity and the polypropylene side is towards the abdominal wall and peritoneum ,the polytetrafluroethylene side is towards the bowel and the omentum . The sutures inside the abdomen are taken outside the abdomen through small stab incisions and tied with square knots.After confirming the adequate overlapping ,any sagging of the mesh is fixed with the help of the tackers . While doing this procedure, the intrabdominal pressure is reduced to 10 mm of Hg . Complete hemostasis is obtained and pneumoperitoneum is released and the port sites closed with 2-0 vicryl and skin with 2-0 vicryl or 2-0 silk .

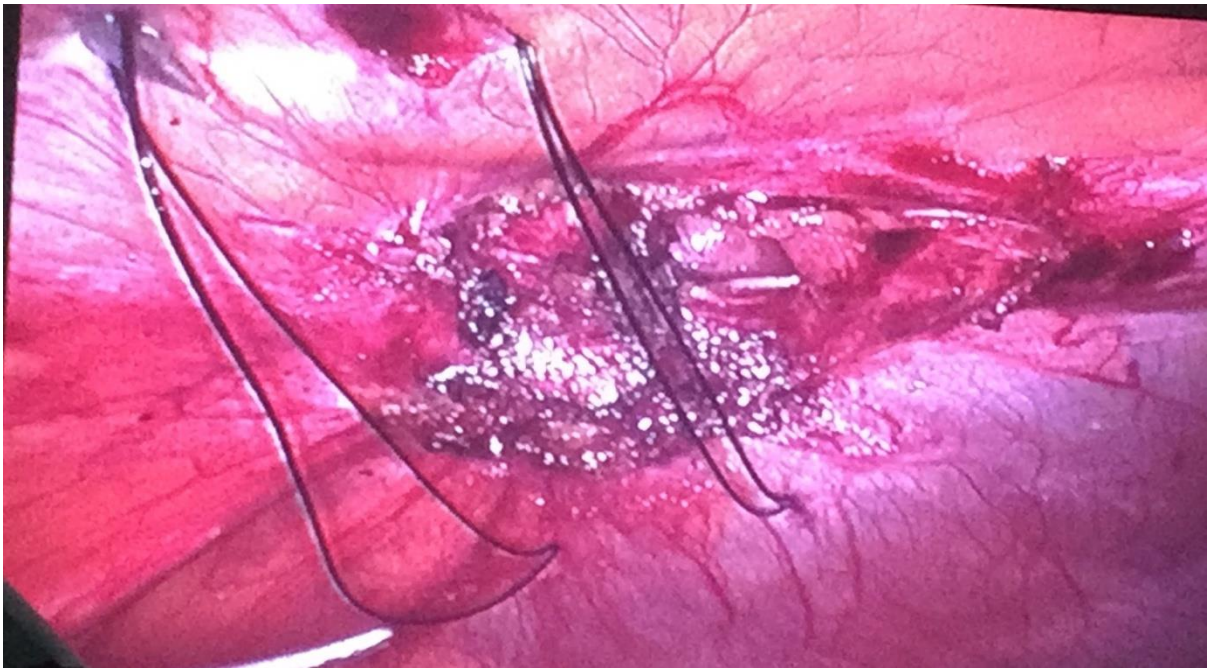
LAPAROSCOPIC SUTURE REPAIR

DEFECT AS VIEWED DURING LAPAROSCOPY

OMENTUM SEEN PLUGGING THE DEFECT

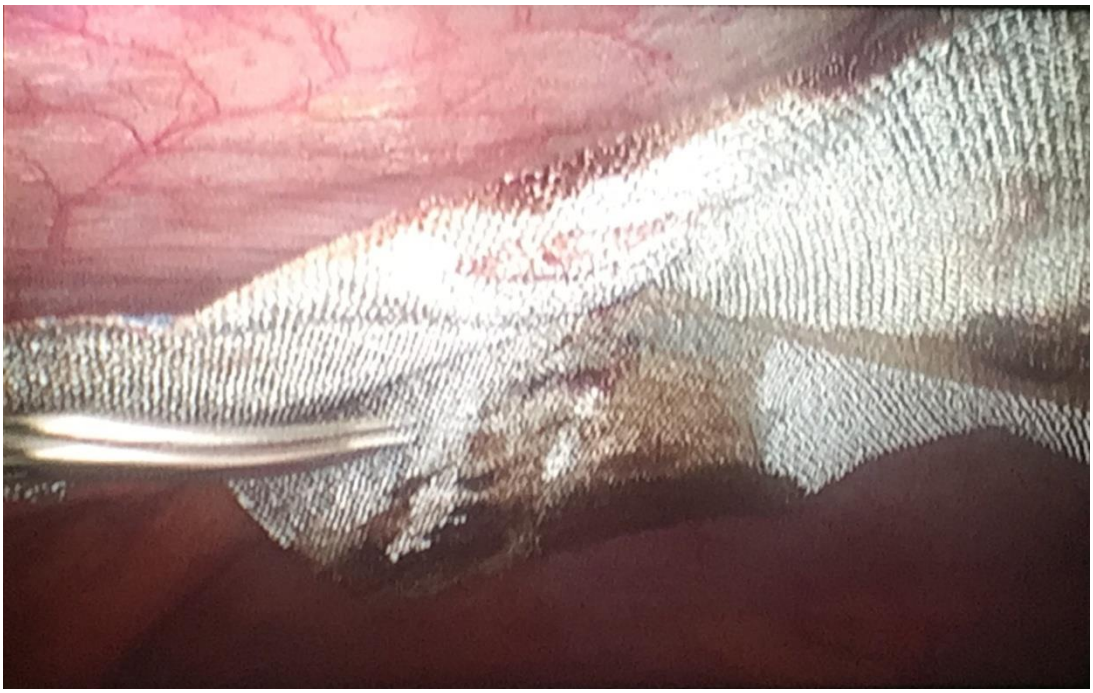


LAPAROSCOPIC SUTURE REPAIR



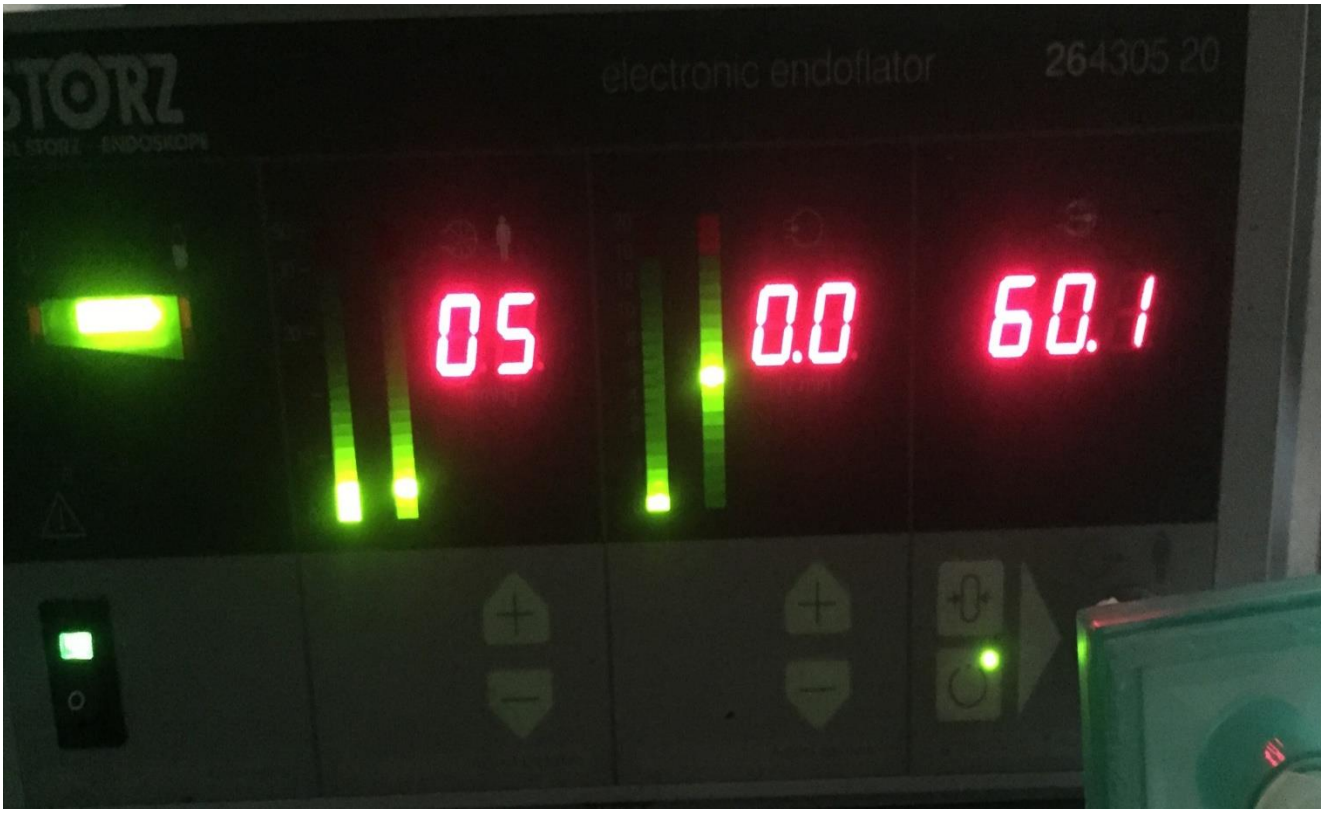
PROCEED MESH

MESH PLACEMENT



TACKERS

LAPAROSCOPIC PRESSURE SEETINGS DURING SUTURING



ANCHORING OF THE MESH OUTSIDE

POST-OPERATIVE PIC

RATIONALE OF LAPAROSCOPIC REPAIR :

In laparoscopic repair the mesh is placed in the intraperitoneal space or the preperitoneal space where the pressure is equally distributed all along the mesh and not on the conventional suture lines which decreases the chance of mesh displacement .When there is an increase in intrabdominal pressure the mesh is kept in place rather being displaced which is the just opposite in case of conventional open onlay repairs .

In open hernia repair it is possible that the surgeon might miss any additional hernias and occult hernias ,but in laparoscopic hernia the surgeon can easily identify all the defects from the inside and can easily define the defects also .

Extensive dissection is not needed for laparoscopic approach to place a good overlapping of the mesh thereby preventing many post operative wound complications when compared to open repair.This is particularly useful in obese patients for obvious reasons .

MESH FIXATION :

Mesh fixation techniques in laparoscopic ventral hernia repair have been extensively discussed in world literature .The physics of laparoscopic repair do not advise tack or any other mesh fixation devices . The tacker is usually 4 mm thick ,the mesh is 1 mm thick and a effective tacker penetrates only about 2 mm.Since a good number of patients in laparoscopic surgery might be obese

the use of tackers are controversial .Some surgeons advocate that it reduces operating time when compared to sutures .

But recent studies have reinforced the superiority of transfascial sutures over tackers.Recent advances in mesh fixation in laparoscopic hernia repair like the **fibrin sealant** has shown to reduce post operative pain ,convalescence and recurrence .

RECURRENCE :

Studies indicate recurrence rate in laparoscopic repair to be around 2 % only .

Mechanisms of recurrences are:

1 .Infection

2 .Inadequate mesh placement

3 .Lateral detachement of mesh

4 . Inadequate mesh fixation

5 . Trauma

6 . Increased abdominal pressure .

But when the technique of herniorraphy and mesh fixation is used together the rate of the recurrence is found to be decreased drastically compared to the conventional open repairs .

SEROMA FORMATION :

Seroma formation occurs in any type of hernia repair even in laparoscopic approach . The seroma usually occurs above the mesh and in the hernia sac .In a large study conducted the incidence of seroma was found to be 11 .8 % .

In another study conducted the seromas which persists after eight weeks were considered to be a complication and the incidence was found to be 2 .6 % .To reduce the incidence of seromas the technique devolped by Carter to close the umbilical defect was used .The defect was closed with absorbable or nonabsorbable sutures or atleast the size reduced .The seromas however rarely cause any long term complications , only when they reach large sizes aspiration is recommended .It is better to preoperatively counsel the patient about seromas formation after laparoscopic repair .

CHRONIC PAIN :

Tackers significantly reduce the post-operative pain.Pain is more in trans abdominal sutures than tackers . The sutures go through the entire abdominal wall and through the muscle .They may cause local ischaemia and may be the reason for severe post operative pain . Cob et al discussed that the intercostal nerve may be trapped in the transabdominal sutures .

Some surgeons prefer to use absorbable sutures like vicryl so that these sutures provide adequate strength till the ingrowth of tissue and also prevent accidental long term entrapment of nerves .Some surgeons prefer that anti inflammatory

drugs and local anaesthesia may be enough to alleviate the symptoms.Local exploration and release of the suture at the site of pain has produced dramatic relief in some patients .

POST OPERATIVE MORBITY :

Apart from the causes mentioned above ,other complications such as unintentional enterotomy ,inter bowel loop abscess ,repiratory failure may increase the hospital stay but these are much less nearly nil when comparable to the open technique .

COST OUTCOMES :

Nowadays cost analysis between open and laproscopic repair of ventral hernia repair are available .In laparoscopic hernia repair the use of dual sided mesh and transabdominal sutures has reduced the post operative pain and hospital stay.Surgical site infection is very less with laparoscopic repair and the cost are now comparable with the open technique.

The type of mesh used and type fixation devices used can determine the cost outcome.

However in the government setup the cost factor is effectively circumvented and hence laparoscopy offers the best available treatment modality for the patients.

USE OF FASCIAL GRAFTS IN HERNIA REPAIR

The advantage of autologous fascial grafts when compared with non biological prosthesis is that they are easily accepted by the host and do not elicit a foreign body response and incorporate a firm collagenous tissue .They also induce collagen synthesis and remodelling of fibrocollagenous tissue .

Most frequently used graft in the human body is FASCIA LATA GRAFT .It is a versatile and strong graft containing dense collagen fibres ,strong enough to resist intrabdominal pressure .The collagen fibres in the fascia lata graft are ideally oriented and they prevent longitudinal slipping of fibrils and fibres . The molecular arrangement in the fascia lata is such that it gives maximum intercross linking giving it strength .

In the olden days ,fascia lata were being used as living sutures . Kirscher was the first person to use fascia lata to bridge fascial defects .The fascia lata graft was found to viable even after a year after implantation ,and there was ingrowth of vascular tissue shown angiographically in the studies .

Moreover ,Gallie and le Mersurier found that the fascial implants are envolped by newly formed vascular tissue within three weeks .

In contrast to scar tissue ,which responds to the physical stress by becoming thin and elongated ,fascia lata retains it shape ,with parallel orientation of fibrils as seen in electron micrography .

The fascia lata graft adheres to the adjacent apomyoneuortic structures more easily than the synthetic prosthesis ,and the graft retains the strength for more over than the year .The fascia lata graft also stimulates the synthesis and remodelling of the collagen synthesis . In clinical practice fascia lata grafts have been used to repair abdominal hernias and abdominal defects over the years .

ANATOMY OF FASCIA LATA

The fascia lata is a tough fibrous sheath enclosing the thigh like a sleeve.In latin the term tesor fascia lata corresponds to “the muscle that stretches the band on the side “ .

ORIGIN AND INSERTION :

Anteriorly it is attached to the inguinal ligament ,laterally to the iliac crest ,posteriorly to the gluteal fascia to the sacrum ,coccyx and the sacro-tuberous ligament and medialy to the pubis the pubic arch and the ischial tuberosity .

Inferiorly on the front and sides of the knee joint ,the fascia lata is attached to bony prominences and the capsule of the knee joint .

The strong popliteal fossa posteriorly is formed with the fascia lata which continues as the deep fascia of the leg .

The fascia lata laterally is thickened as s 5 cm thick band called iliotibial tract.This tract splits into two layers : the superficial lamina is attached to the tubercle of iliac crest ,and the deep lamina to the capsule of the hip joint .The tract below attaches to the lateral condyle of the tibia .The gluteus maximus and the tensor fascia latae attaches to the tract in the upper part .

FUNCTIONS : The tensor fascia latae tenses the fascia lata .Its oblique fibres stabilises the knee joint in extension and in partial flexion ,hence constantly used for walking and running.In erect posture it stabilises the pelvis and in partial flexion in leaning forward position stabilises the knee joint .The tensor fascia lata is also an abductor of the hip joint .

NERVE SUPPLY :

The muscle is supplied by the superior gluteal nerve L4, L5 and S1 .

BLOOD SUPPLY :

The muscle and the fascia lata is supplied by the superior gluteal artery and lateral circumflex artery .

TECHNIQUE OF FASCIA LATA HARVESTING

The muscle tensor fascia lata to be used as a free musculocutaneous flap was first described by Hill ,Nahai and Vasconez in the year 1978 .

The anterior superior iliac spine and the iliac crest is palpated .A line joining the lateral most part of the iliac crest and the lateral femoral condyle is drawn which marks the course of the fascia lata .

A . HARVEST OF FASCIA LATA THROUGH A LONGITUDINAL INCISION :

1 . A 3 to 5 cm longitudinal incision is marked in the lateral part of the thigh ,such that the the incision is centered in the junction of upper one third and middle one third of the thigh .

2 . The incision is carried down to fascia lata level without harvesting the fat .

3 . The incision is cut laterally and medially which defines the width of the fascia lata graft .

4 . The fascia lata is then removed from the muscle carefully ,the muscle should not be violated in anyway .

5 . After removing the fascia lata graft , the wound is closed in two layers using 2-0 vicryl after keeping the suction which is only kept if necessary .

B . HARVESTING A LONG STRIP OF FASCIA LATA USING FASCIA LATA STRIPPER

1 . A 4 cm incision is made above the knee joint laterally over the iliotibtial tract .

2 . The incision is deepened to the fascial layer .

3 . An 1.5 cm incision is made over the fascia and a 2-0 silk is attached to the fascia to facilitate the threading the fascia lata stripper .

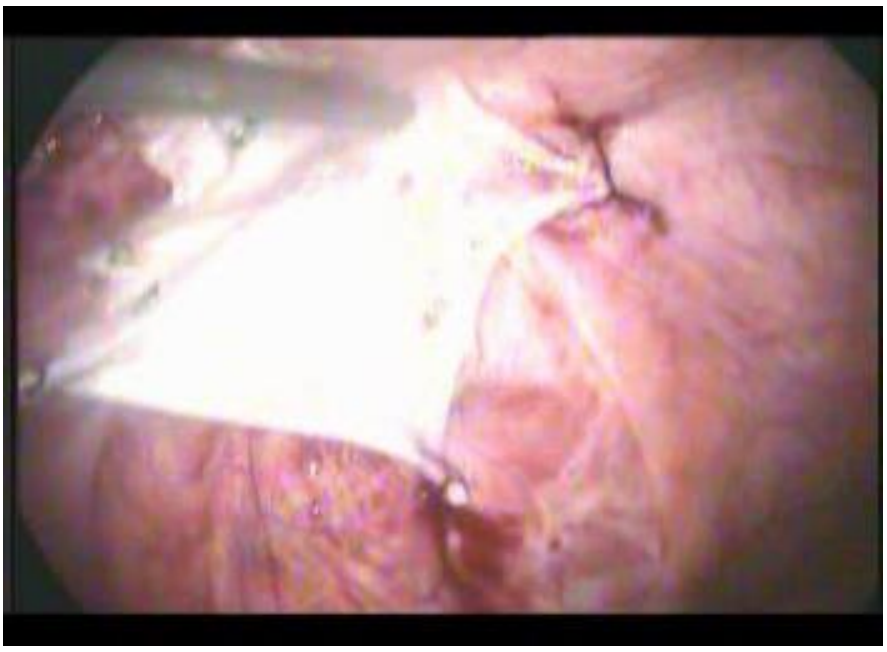
4 .The stripper is engaged and the stripper is pushed superiorly and several strips can be harvested .

5 . The wound is closed with 2-0 vicryl and penrose drain can be kept if necessary .

When a large flap is raised the disadvantages are herniation of muscle , long scar , instability of the knee joint and skin grafting may be necessary to close the raw area .

AUTOLOGOUS FASCIA GRAFT :

FASCIA LATA LAPAROSCOPICALLY BEING FIXED TO THE ABDOMINAL WALL :



ROLE OF FASCIA LATA IN REPAIR OF VENTRAL HERNIAS

In clinical practice ,free fascia lata grafts are used for repair of abdominal hernias and abdominal wall defects .In many reported series ,the grafts were used for reconstruction in a contaminated environment .

In earlier reports ,reherniation rates of 6 to 15 % were found after hernia repair with fascia lata .Peacock used free fascia lata as onlay grafts after primary closure of ventral hernias to reinforce the myoaponeurotic wall and stimulate the synthesis of collagen .He found reherniation in only 1 of the 17 patients after a follow up 2 to 5 years .Recently ,two larger series of patients with ventral hernias repaired with free fascia lata grafts were reported. Williams et al reconstructed 12 ventral hernias of which 7 of them were done in a contaminated environment .post operative complication included two cases of soft tissue dehiscence (graft intact), two patients with graft breakdown and one patient with a recurrent bowel fistula .reherniation occurred in 1 of the 12 patients .the fate of the patients with graft breakdown and recurrent fistula are not mentioned .

Disa et al performed abdominal wall reconstructions with autologous fascia lata in 32 patients of which 30 were performed in a contaminated field.Post operative complications include cellulitis in three ,seroma in two ,and skin dehiscence with exposed fascia grafts in seven patients .In five of the seven

patients with a wound dehiscence ,the wound healed by secondary intention ; in two patients graft was covered by split skin graft .

Donor site complications occurred in 12 to 18 % of the reported series ; no cases of knee instability were found .

In our study ,this fascia lata was used to repair umbilical hernia through laparoscopic inlay technique alone after harvesting it.

ELIGIBILITY CRITERIA

A.Inclusion criteria:

1. Patients with age more than 18 years in both sexes presenting as a case of umbilical or paraumbilical hernia either in the Surgery OP department or casualty of Government Rajaji Hospital Madurai during the time period fromMarch 2016 to September 2016.
2. Patients consented for inclusion in the study according to the designated proforma after giving informed written consent.

B.Exclusion criteria:

1. Patients with age less than 18 years.
2. Patients with coagulopathy, severe cardiopulmonary disease, ascites and renal failure are excluded.
3. Patients reluctant to undergo surgical correction by giving consent.

MATERIALS AND METHODS

From March 2016 to September 2016, patients presenting in the Surgical OP Department and Casualty of Government Rajaji Hospital,Madurai with Umbilical and Paraumbilical Hernias are added into the study group.

A total of 50 patients were recruited for the study based on the eligibility criteria. All the patients who got admitted would be given a brief outline of the study programme and the procedure they would be undergoing.They would be requested to give their informed written consent for being part of the study.Those who resented to do so would be excluded from the study. Relevant data regarding history, clinical examination and investigations were collected and properly recorded. The patients would then be divided into Case and control groups, with the former(case group) undergoing Laparoscopic repair(either primary closure(LSR) or Mesh repair/tissue repair(LRWM) according to the indication) and the latter(control group) undergoing conventional open repair (either Primary suture repair(OSR) or Onlay Mesh technique(ORWM)).Care is taken to ensure that the type of repair the patients undergo is unbiased and the case and control groups are alike.

The patients were then followed up into the post-operative period and daily progress cards maintained.

The study subjects are then carefully followed up in terms of various aspects like Duration of their stay in hospital and subsequent Return to Normal Activity(RTNA),development of any post-operative infections, complications, complaints of constant pain or sensory disturbances and also for immediate

recurrences and morbidity and are carefully documented. They are also requested upon discharge,to come back in case they experience any problems in the long run.

The data entered were analysed at the end of the study and observations were noted down and conclusions made regarding the efficacy of the two types of surgical repair techniques.

ANALYSIS OF DATA

In my study,a total of 50 patients who were admitted as a case of either Umbilical or Paraumbilical hernia in the Surgery Department of Government Rajaji Hospital,Madurai were selected.The patients would then be divided into the Case group(those who would undergo Laparoscopic Repair) and control group(those who would undergo open repair) after they satisfy the eligibility criteria laid out.

The patients were then divided into four groups based on the repair they underwent.

GROUP I : Patients who underwent Primary Open Suture Repair(OSR)

GROUP II : Patients who underwent Open Repair With Mesh placement(ORWM)

GROUP III : Patients who underwent Laparoscopic Suture Repair(LSR)

GROUP IV : Patients who underwent Laparoscopic Repair With Prosthesis which could be either:

a) Laparoscopic Repair With Mesh(LRWM)
b) Laparoscopic Repair with Fascia lata(LRWF)

In general,the comparisons were made between the Laparoscopic repair and Open repair based on various parameters which are enlisted below:

PARAMETERS ASSESSED:

1) Return to Normal Activity(RTNA) which in turn is assessed by:
    a) Post-operative day of return of bowel sounds
    b) Post-operative day of starting oral feeds
2) Pain assessed by the Numeric Pain Rating Scale
3) Sensory disturbances
4) Bladder/bowel disturbances
5) Wound infections
6) Post-operative day of discharge
7) Recurrences.

ASSESSMENT OF OUTCOME

Assessment of outcome is done with a Quality of Life(QOL) assessment scoring system with:

1) EuraHS-QOL(European Hernia Society Scale)
2) Carolina Comfort Scale
3) Pain Rating Scale

This provides for an objective assessment of outcome while comparison in both the open repair and laparoscopic repair groups.

1) EURAHS-QoL (European Hernia Society Scale)

EuraHS-QoL Preoperative

Pain at the site of the hernia												
	0 = no pain										10 = worst pain imaginable	
In rest (lying down)	0	1	2	3	4	5	6	7	8	9	10	
During activities (walking, biking, sports)	0	1	2	3	4	5	6	7	8	9	10	
Worst pain felt during the last week	0	1	2	3	4	5	6	7	8	9	10	
Restrictions of activities because of pain or discomfort at the site of the hernia												
	0 = no restriction										10 = completely restricted	
Daily activities (inside the house)	0	1	2	3	4	5	6	7	8	9	10	X
Outside the house (walking, biking,driving)	0	1	2	3	4	5	6	7	8	9	10	X
During sports	0	1	2	3	4	5	6	7	8	9	10	X
During heavy labour	0	1	2	3	4	5	6	7	8	9	10	X
											X = If you do not perform this activity	
Cosmetic discomfort												
	0 = very beautiful										10 = extremely ugly	
The shape of your abdomen	0	1	2	3	4	5	6	7	8	9	10	
The site of the hernia	0	1	2	3	4	5	6	7	8	9	10	

EuraHS-QoL Postoperative

Pain at the site of the hernia repair												
	0 = no pain										10 = worst pain imaginable	
In rest (lying down)	0	1	2	3	4	5	6	7	8	9	10	
During activities (walking, biking, sports)	0	1	2	3	4	5	6	7	8	9	10	
Worst pain felt during the last week	0	1	2	3	4	5	6	7	8	9	10	
Restrictions of activities because of pain or discomfort at the site of the hernia repair												
	0 = no restriction										10 = completely restricted	
Daily activities (inside the house)	0	1	2	3	4	5	6	7	8	9	10	X
Outside the house (walking, biking,driving)	0	1	2	3	4	5	6	7	8	9	10	X
During sports	0	1	2	3	4	5	6	7	8	9	10	X
During heavy labour	0	1	2	3	4	5	6	7	8	9	10	X
											X = If you do not perform this activity	
Cosmetic discomfort												
	0 = very beautiful										10 = extremely ugly	
The shape of your abdomen	0	1	2	3	4	5	6	7	8	9	10	
The site of the hernia and the scars	0	1	2	3	4	5	6	7	8	9	10	

2) CAROLINA COMFORT SCALE

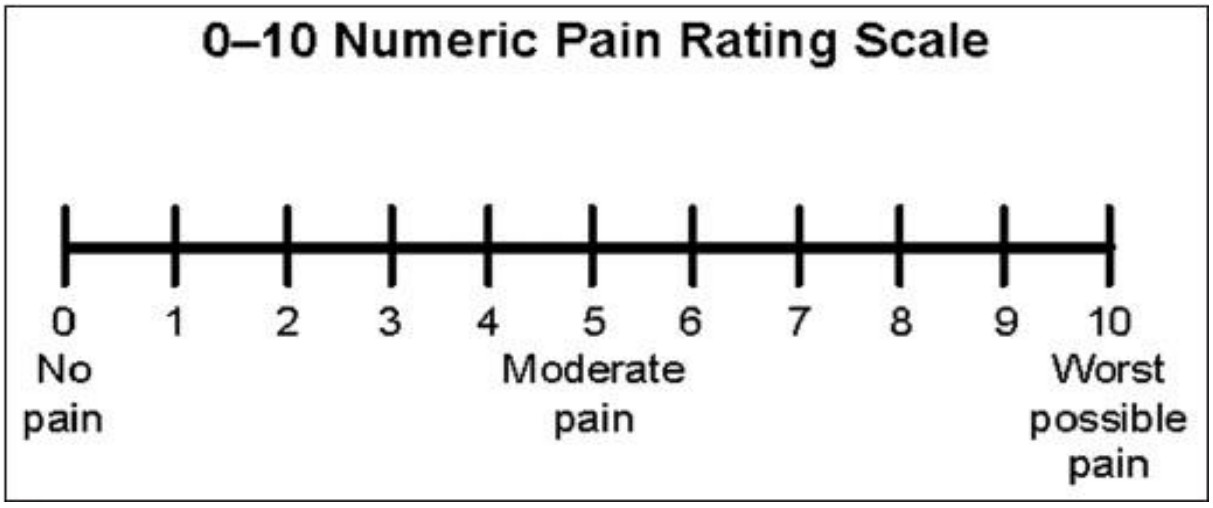
- 3 Questions for 8 activities:

1) Sensation of mesh?
2) Pain?
3) Movement limitations?

- **Activities**: Laying down | Bending over | Sitting | Activities of daily living | Coughing or deep breathing | Walking | Stairs | Exercising.
- Each question carries 0 - 5 points for each activity.
- Maximum 40 points for sensation and pain.
- Maximum 35 points for movement limitations.
- For each activity maximum 15 points.

3) 0-10 NUMERIC PAIN RATING SCALE

The severity and quality of pain is assessed by the 0-10 Numeric Pain Rating Scale.



In the study, eleven(11) of the fifty(50) patients underwent Open Suture Repair(OSR) while fourteen(14) patients underwent the Open Repair With Mesh (ORWM).In the laparoscopic group, eleven(11) of the total fifty underwent Laparoscopic Suture Repair(LSR) and thirteen(13) underwent repair by Laparoscopic mesh repair(LRWM) and one underwent laparoscopic fascia lata repair(LRWF).

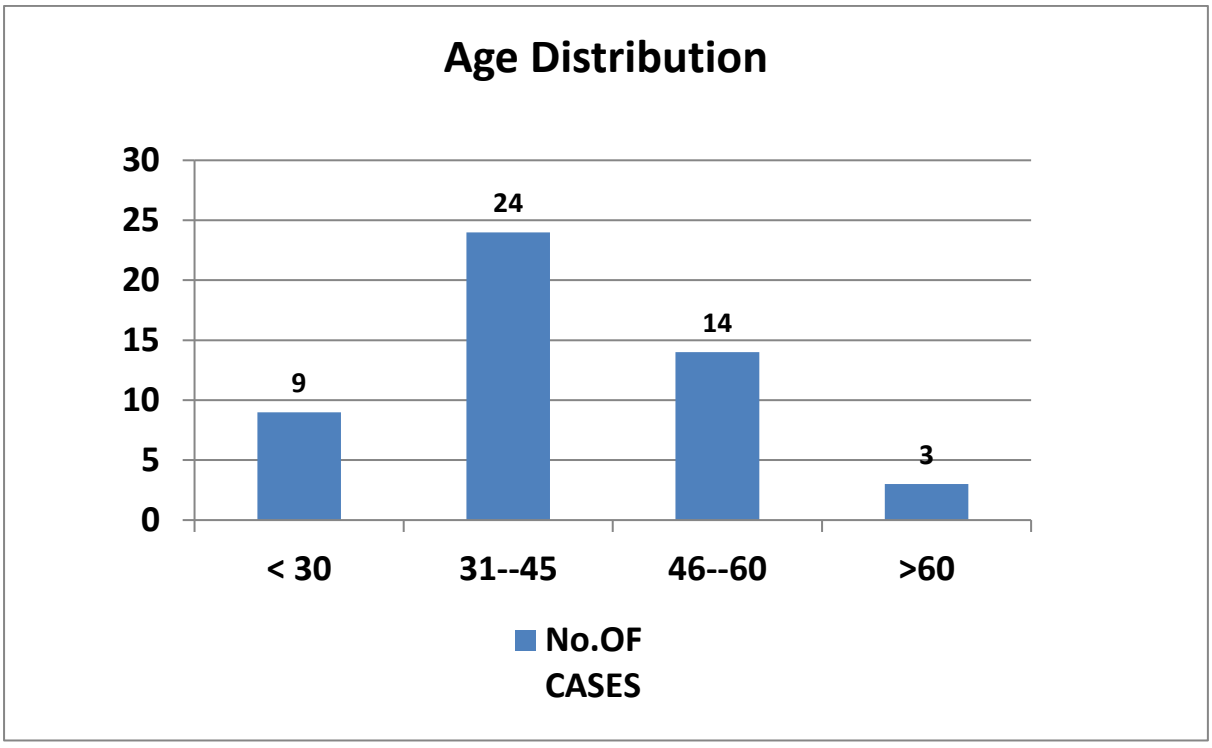
The Statistical Analysis was done by ANOVA test and CHI-SQUARE test and was recorded and inferences drawn.

RESULTS AND DISCUSSION

TABLE-1

AGE DISTRIBUTION

AGE	No.OF CASES	%
≤ 30	9	18
31--45	24	48
46--60	14	28
>60	3	6
TOTAL	50	100
Mean	41.28	
SD	11.5	



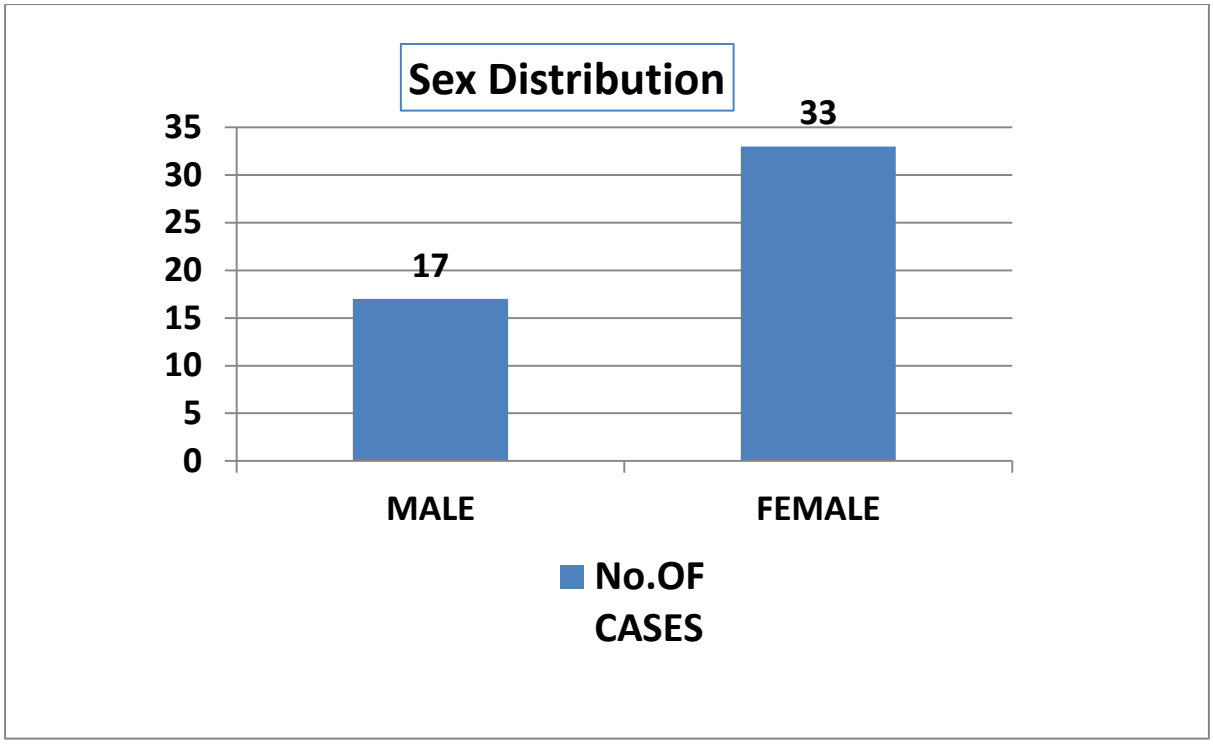
In our study,the patients predominantly belonged to the middle age group between the age of 31-45 with about 48% of the total study group.Patients in the age group 46-60 came second in prevelance.

Studying the world literature ,umbilical hernia in adults are more common in the middle aged persons and women in their reproductive age group with multiple pregnancies are more vulnerable . As such the incidence of umbilical hernia is less studied around the world.

Close observation of data shows that Laparoscopic repair with mesh(LRWM) was undergone mostly by people in the age group 31-45 while Laparoscopic suture repair(LSR) mostly in the <30 age group.There was not much difference between the age groups undergoing open repair.

TABLE-2 : SEX DISTRIBUTION

SEX	No.OF CASES	%
MALE	17	34
FEMALE	33	66
TOTAL	50	100

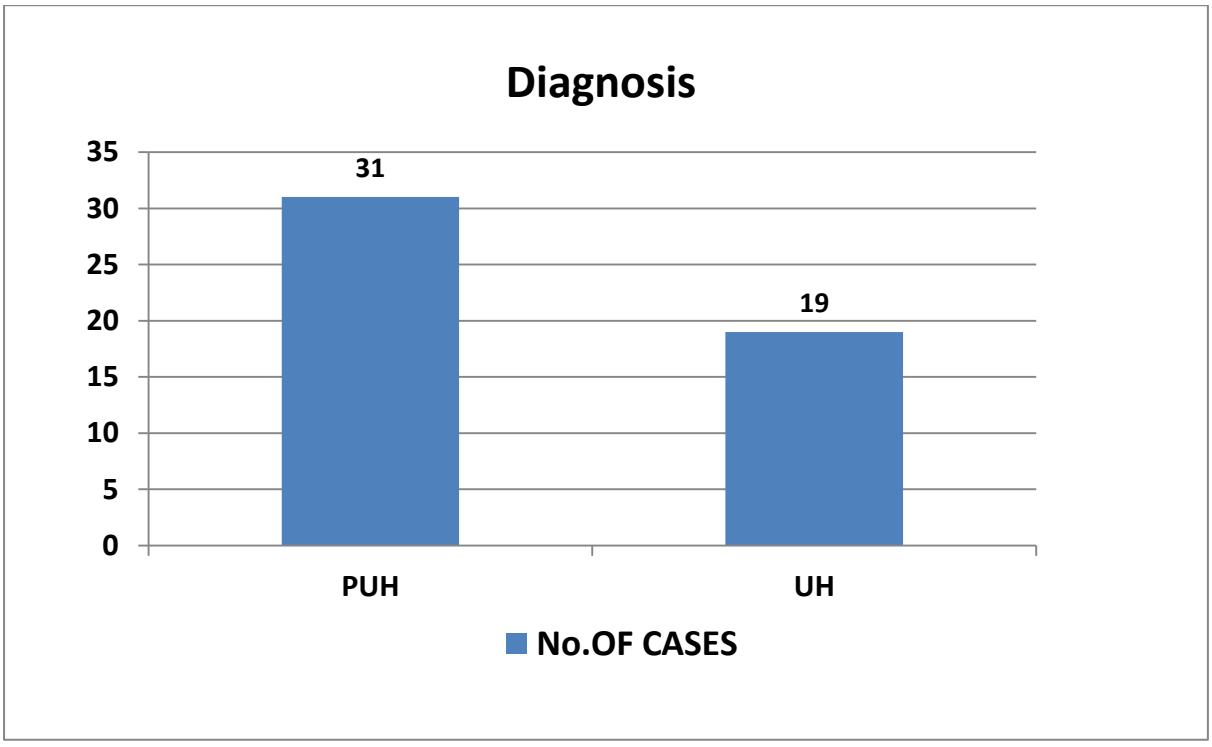


In our study of 50 patients,majority of them-66% were females while males accounted to for about 34% only.

Worldwide the incidence of umbilical hernia in adults shows the predominance in the female sex ,with female to male ratio approaching 1.7 :1 (Golladay) The reasons for this female predominance is thought to be due to the increased stretching of the abdominal wall during multiple pregnancies . In our study also females have a higher incidence than males corresponding to world literature and with similar risk factors.

TABLE-3: DISTRIBUTION OF CASES AMONG UMBILICAL HERNIA AND PARAUMBILICAL HERNIA

DIAGNOSIS	No.OF CASES	%
PUH	31	62
UH	19	38
TOTAL	50	100

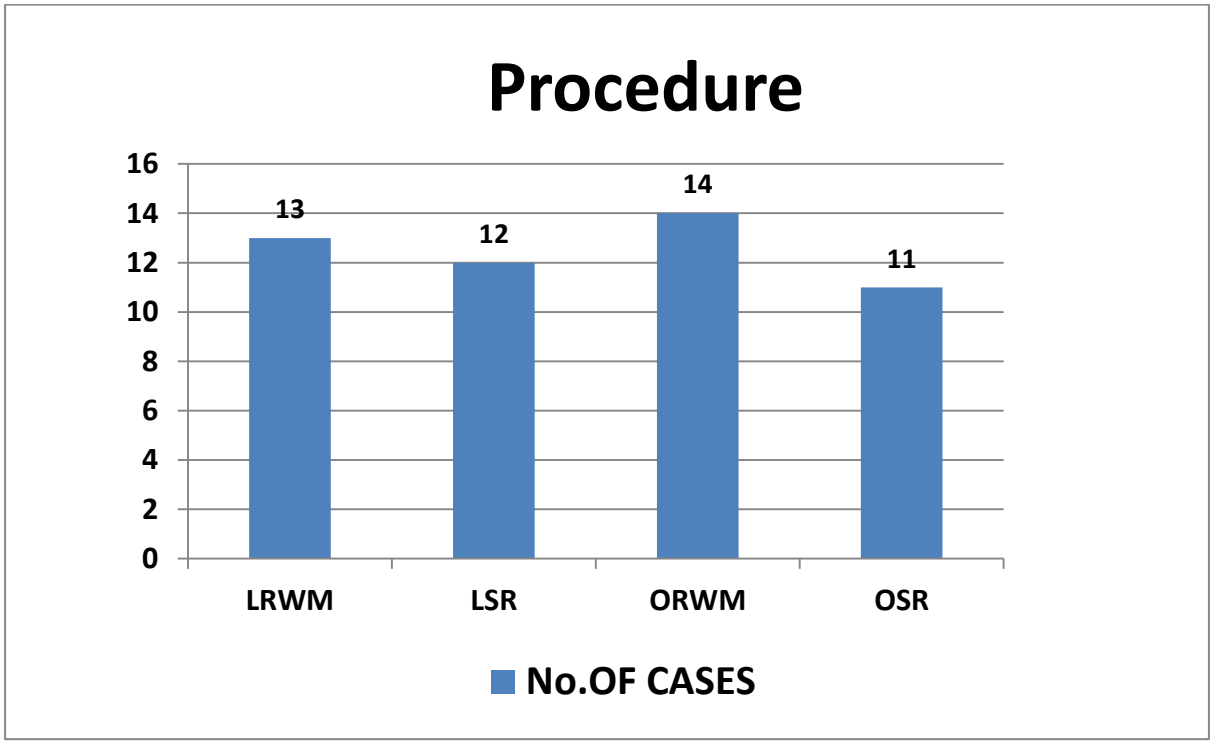


Out of the total 50 cases we had,31 out of them were paraumbilical hernias pointing to the fact that a majority of the cases which were thought to be umbilical hernias are in fact paraumbilical hernias.

This is in par with the literature that Paraumbilical hernias are more common in adults than pure Umbilical hernias.This doesn't however alter the management even slightly because essentially the technique of repair in both types of hernias are the same.

TABLE-4 : TYPE OF SURGERY UNDERGONE

PROCEDURE	No.OF CASES	%
LRWM/LRWF	13	26
LSR	12	24
ORWM	14	28
OSR	11	22
TOTAL	50	100



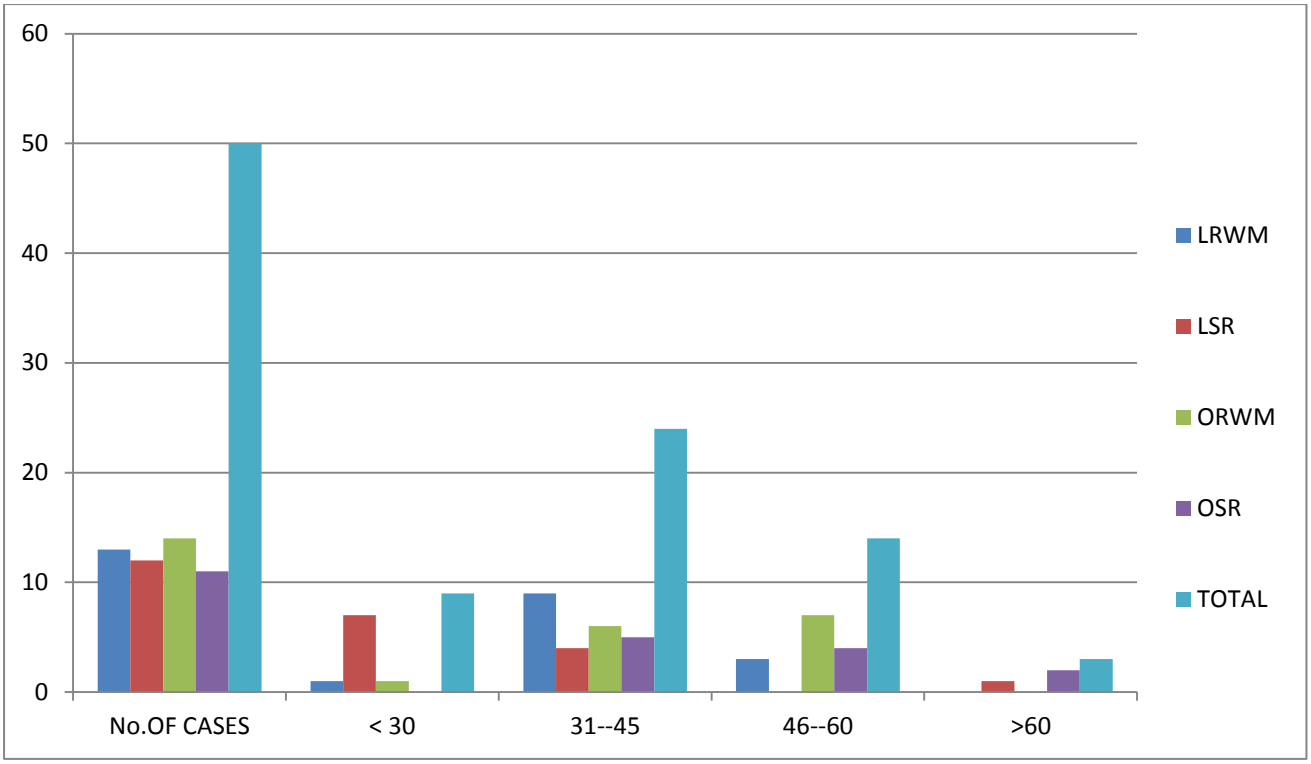
The cases and control groups were divided such that the number of patients who underwent laparoscopic repair and open repair were equal but the type of repairs they underwent were different.

14 patients underwent the Open repair with mesh(ORWM) and 11 underwent Open Suture repair(OSR).Among the laparoscopic group,while 12 of them underwent Laparoscopic Suture Repair(LSR),12 of them underwent Laparoscopic repair with Mesh and one of them underwent Fascia lata repair.

So the number of patients who underwent each procedure was almost the same.

TABLE-5: COMPARISON BETWEEN THE TYPE OF SURGICAL REPAIR UNDERWENT IN RELATION TO THE AGE GROUP

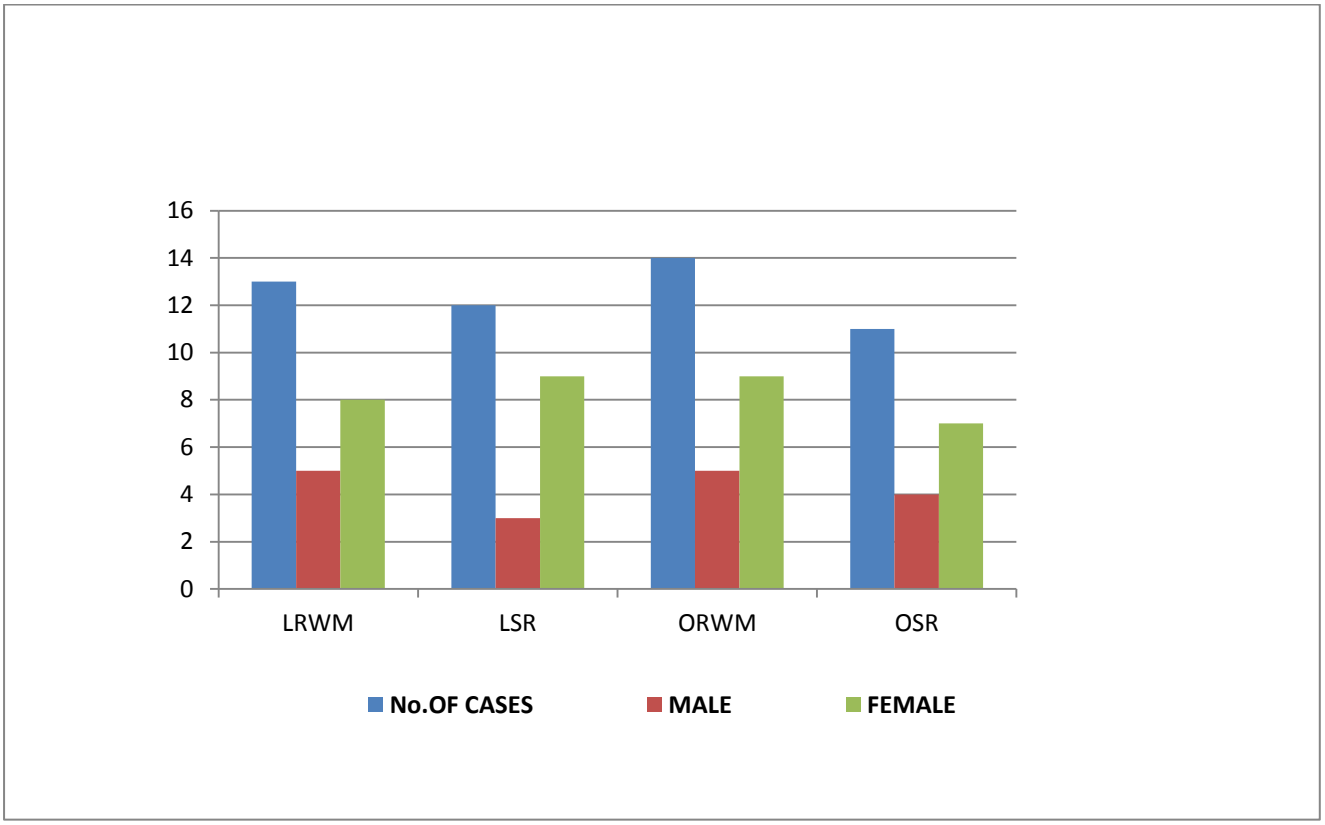
PROCEDURE vs AGE	No.OF CASES	$\leq$ 30	31--45	46--60	>60
LRWM	13	1	9	3	0
LSR	12	7	4	0	1
ORWM	14	1	6	7	0
OSR	11	0	5	4	2
TOTAL	50	9	24	14	3



This bar diagram shows the distribution of the type of surgery underwent in relation to the age group as was inferred out of our analysis.

TABLE-6: COMPARISON BETWEEN THE TYPE OF SURGICAL REPAIR UNDERWENT IN RELATION TO THE GENDER

PROCEDURE vs SEX	No.OF CASES	MALE	FEMALE
LRWM	13	5	8
LSR	12	3	9
ORWM	14	5	9
OSR	11	4	7
TOTAL	50	17	33

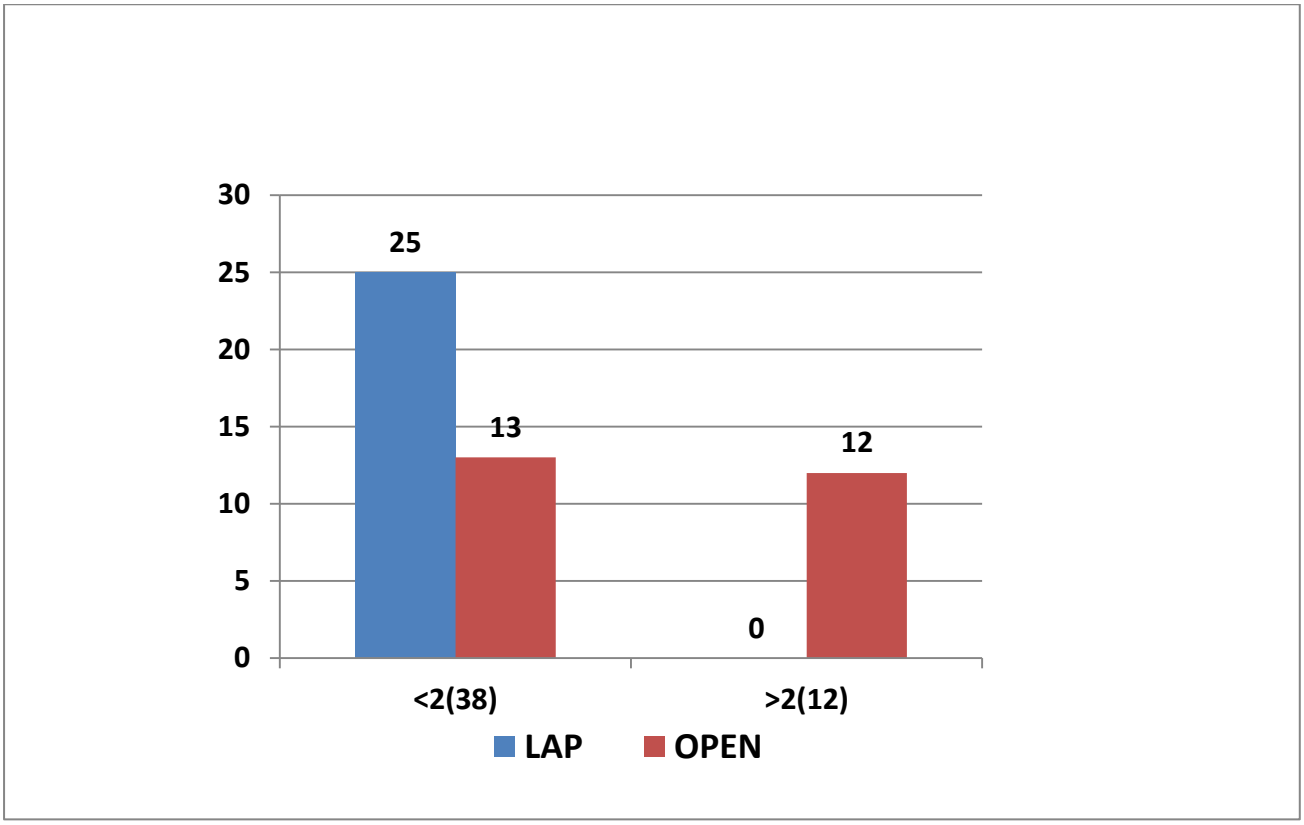


This bar diagram shows the distribution of the type of surgery underwent in relation to the gender as drawn from our statistics.

TABLE-7 : COMPARISON OF POST-OPERATIVE DAY OF RETURN OF BOWEL SOUNDS

POD of return of BS(days)/No	LAP	OPEN
≤2 (38)	25	13
>2 (12)	0	12
p value	0.003	significant

BAR DIAGRAM SHOWING THE COMPARISON BETWEEN LAPAROSCOPIC AND OPEN CASES IN TERMS OF RETURN OF BOWEL SOUNDS

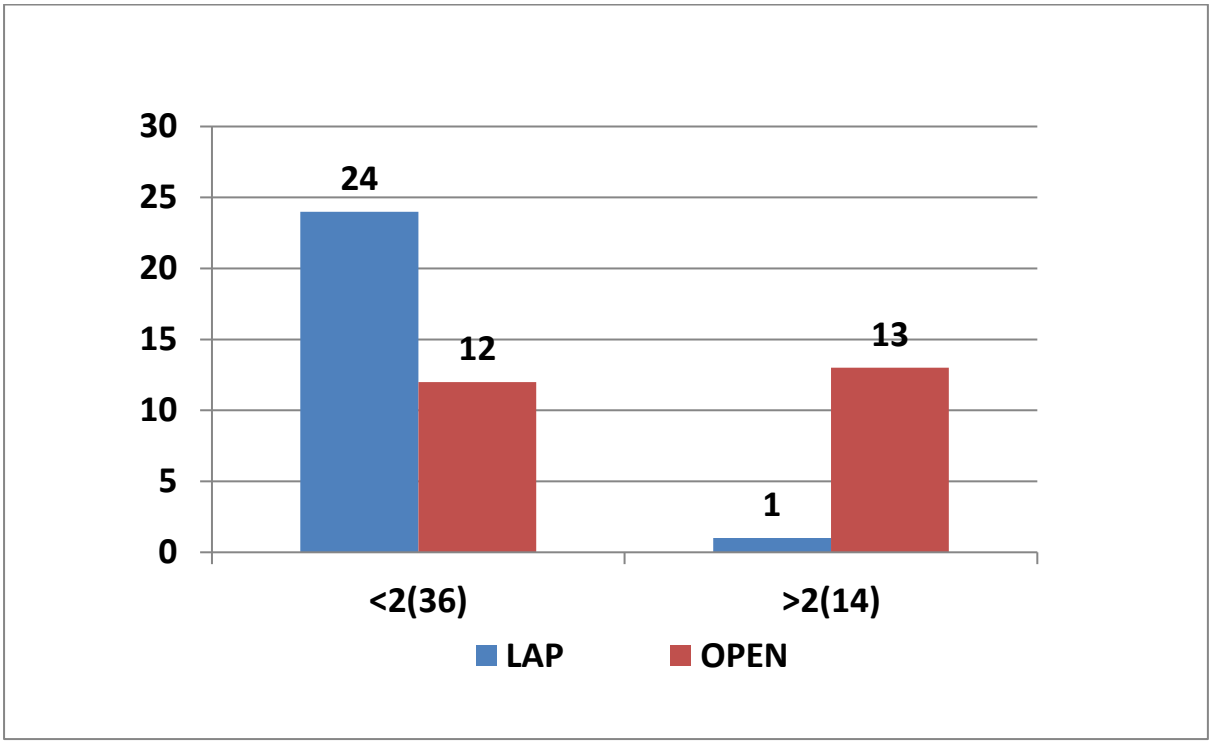


As can be clearly seen from the above data,there was faster return of bowel sounds in patients who underwent laparoscopic repair irrespective of the type of procedure they underwent.All laparoscopic patients had bowel sounds back in 2 days whereas only 13 of the open cases had return of bowel sounds in 2 days.

Literature shows that there is early return of bowel activity in laparoscopic procedures hence there is early Return To Normal Activities(RTNA) which has also been validated in the study.The p-value was significant(0.003).

TABLE-8: POST-OPERATIVE DAY(POD) OF STARTING ORAL FEEDS

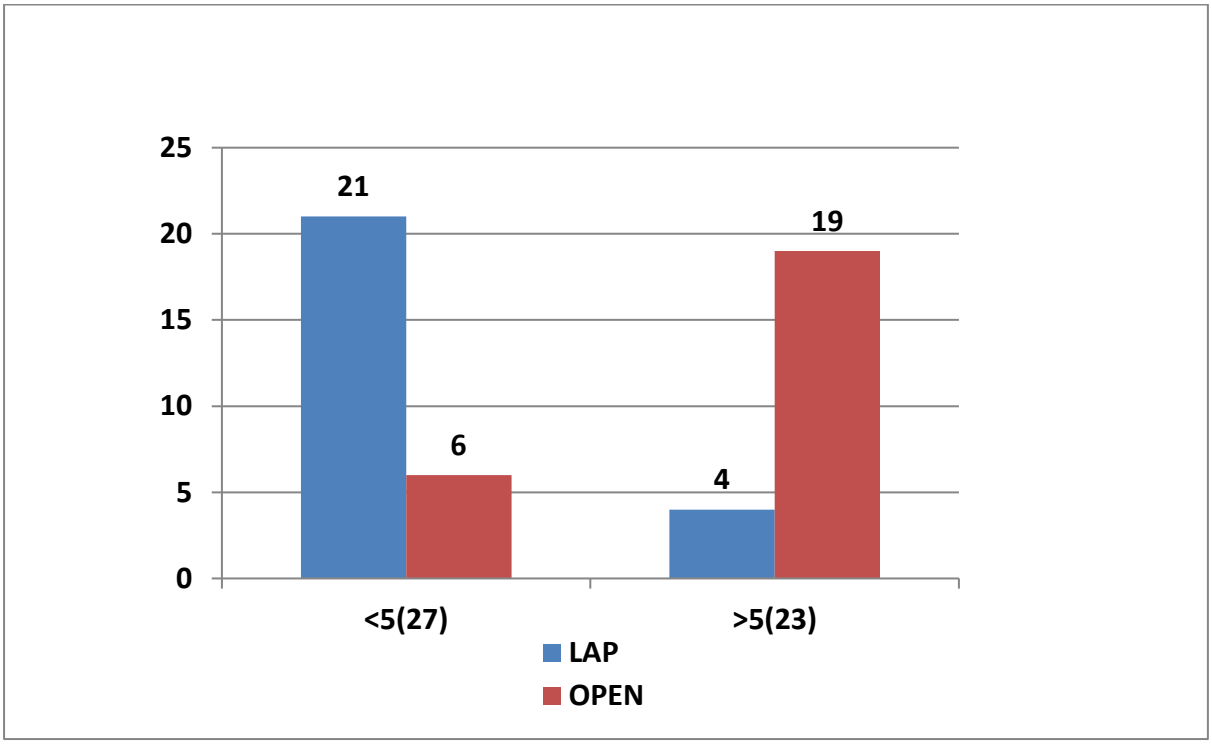
POD of starting oral feeds(days)/No.	LAP	OPEN
≤2 (36)	24	12
>2 (14)	1	13
p value	0.048	Significant



Initiation of oral feeds was done within 2 days in 36 patients of which 24 patients had laparoscopic repair.13 of the 14 patients(92.8%) who had delay in initiation of oral feeds belonged to the open category once again showing there is earlier RTNA in laparoscopic repair.

TABLE-9 : POST-OPERATIVE PAIN AS PER NUMERIC PAIN RATING SCALE

PAIN(Numeric Pain Rating Scale)	LAP	OPEN
≤5 (27)	21	6
>5 (23)	4	19
p value	0.033	Significant



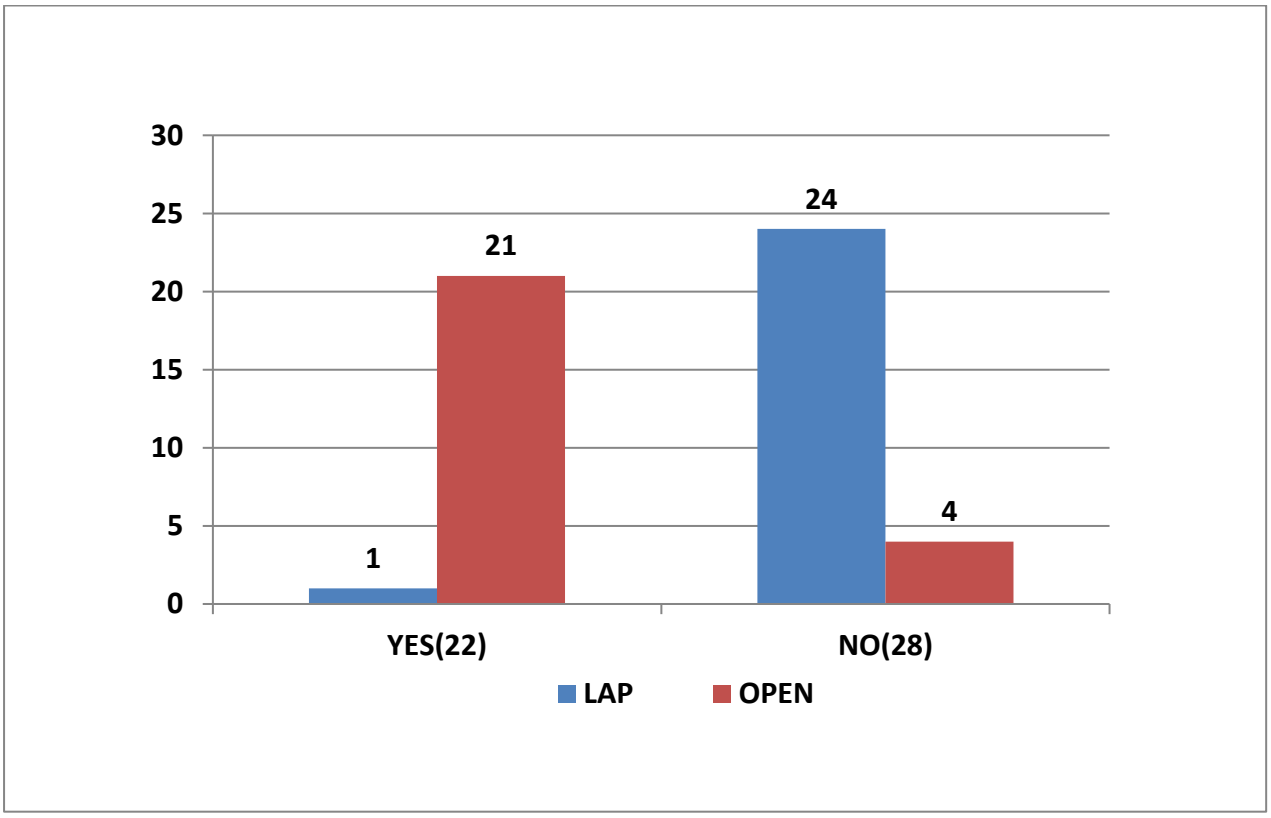
Pain was assessed by the Numeric Pain Rating Scale wherein the patients were asked to rate their pain in terms of numbers from 1 to 10.As is clearly shown in the data,of the 27 patients who rated their pain below 5,21 of them were laparoscopic group.19

out of the 23 patients(82.6%) who had severe pain were those who underwent open repair. The p-value was significant with 0.033.

Thus it has been statistically proven that post-operative pain is more in open repair and significantly reduced with the advent of laparoscopic repair.

TABLE-10 : POST-OPERATIVE SENSORY DISTURBANCES

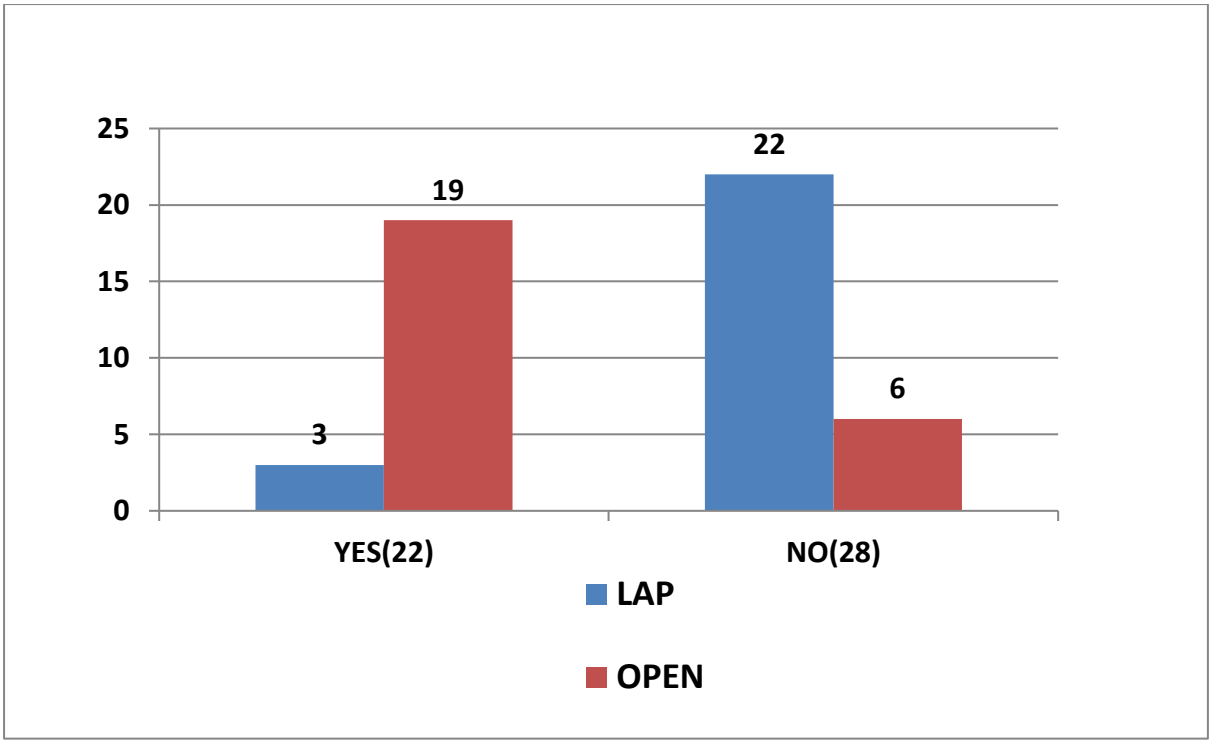
Sensory disturbances	LAP	OPEN
YES (22)	1	21
NO (28)	24	4
p value	< 0.001	Significant



Post-operative sensory disturbances at the site of incision was present in 22 patients of which only one patient had undergone laparoscopic repair. 96% of the patients who underwent laparoscopic repair had absolutely no sensory disturbances as against 84% of the open repair patients who had varying degrees of altered sensory perceptions post-operatively at the site of surgery.

TABLE-11 : POST-OPERATIVE BLADDER/BOWEL DISTURBANCES

Bladder/bowel disturbances	LAP	OPEN
YES (22)	3	19
NO (28)	22	6
p value	0.008	Significant

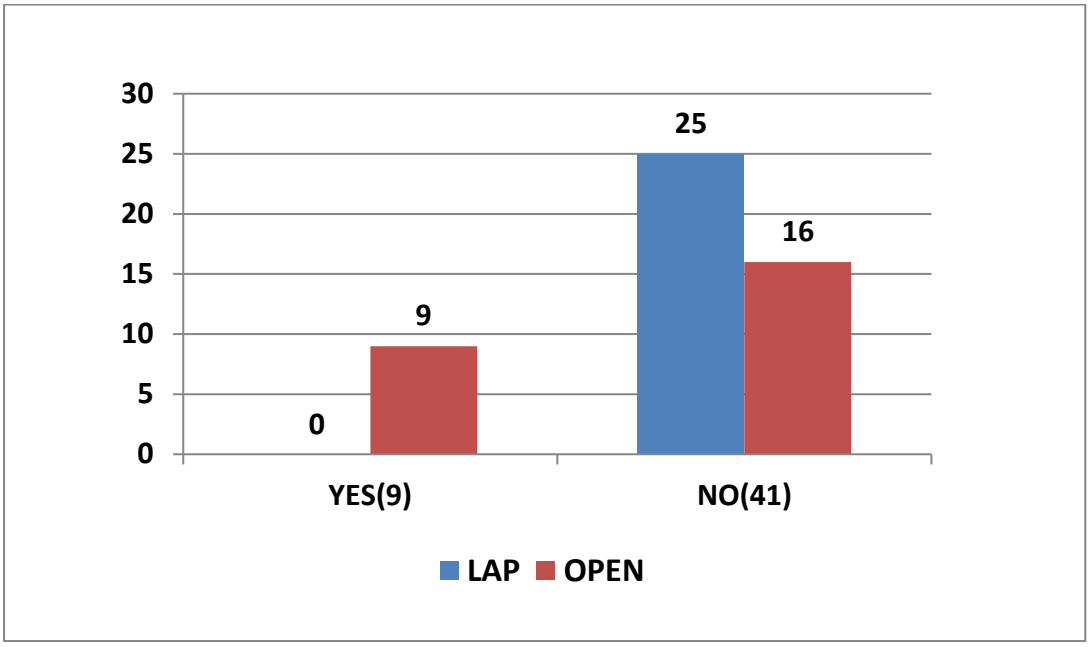


Post-operative disturbances like urinary retention can occur following extensive dissection or traction to the nerves during open repair which is significantly reduced in laparoscopic repair.

In our study, of the 22 patients who complained of urinary retention and delayed passage of flatus,19 of them (86.36%) had undergone open repair.On the other hand,88% of patients who underwent laparoscopic repair had no complaints of bowel or bladder function.

TABLE-12 : WOUND INFECTION FOLLOWING SURGERY

Wound infection	LAP	OPEN
YES (9)	0	9
NO (41)	25	16
p value	0.015	Significant



Among the 25 laparoscopic cases,none of them developed any wound infection in the post-operative period either during their stay in the hospital or on follow-up wherein 36% (9 out of 25) of patients who underwent open repair developed wound infection.

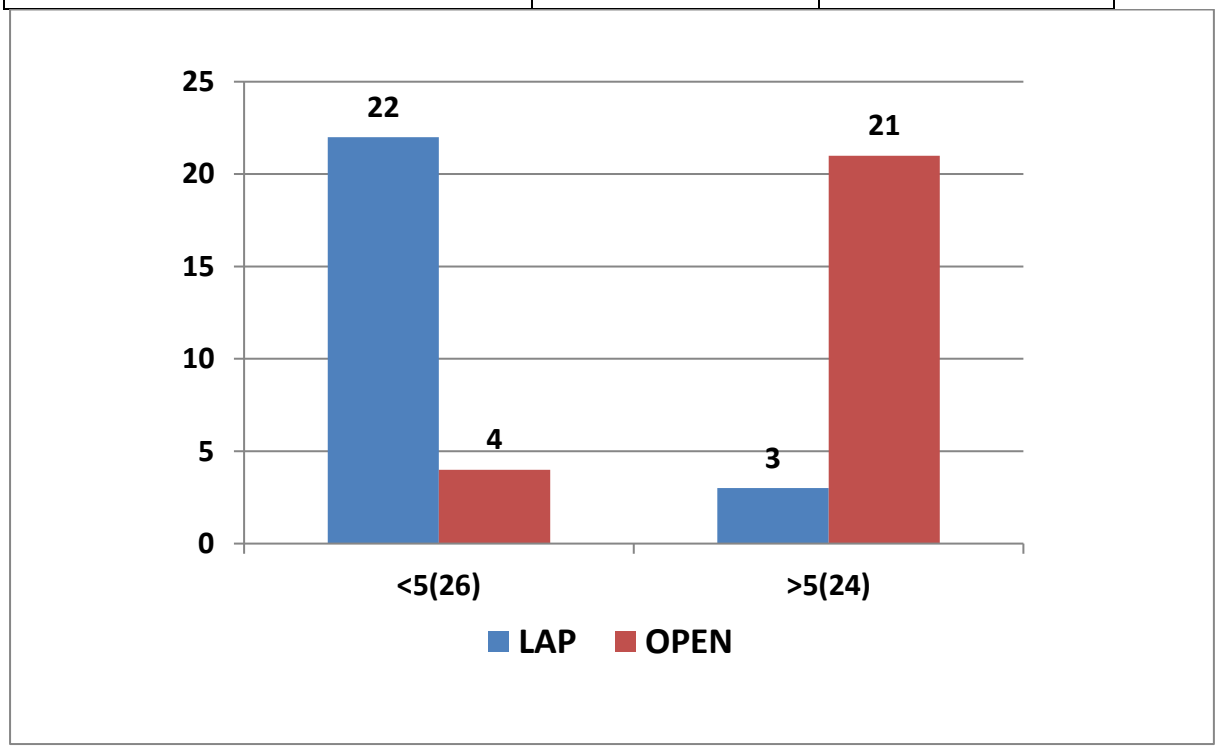
The reasons for more infection in the open repair may be due to the excessive dissection and possible seroma formation with secondary infection .The umbilicus unlike the other areas in the abdominal wall is less adequately supplied by the blood vessels hence deceased entry by the body immune mechanisms.

Excessive dissection of the umbilicus from the flap may cause it to undergo necrosis and increase the chance of infection .This is avoided in laparoscopic repair .The umbilicus also is a well known area to harbour pathogens which increases the chances of infection. Most of the cases which got infected are of superficial type of SSI ,and these were treated with antibiotics and saline dressing alone

In our study the open repair group had a higher rate of infection than the laparoscopic cases (p-value : 0.015).

TABLE-13 : POST-OPERATIVE DAY OF DISCHARGE

POD of discharge(days)	LAP	OPEN
≤5 (26)	22	4
>5 (24)	3	21
p value	0.007	Significant

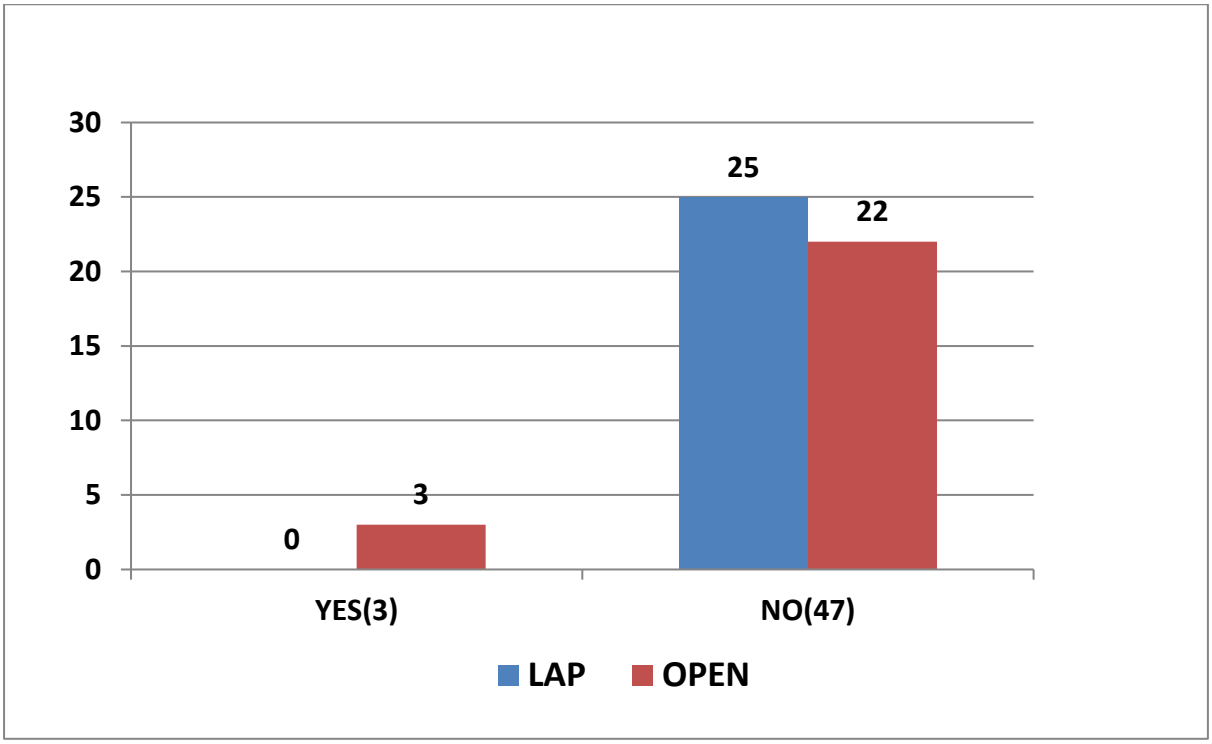


26 of the patients who underwent repair were discharged on or before the 5th post-operative day.Of these,as expected, 22 of them were from the laparoscopic repair group.

So,88 % of patients who underwent laparoscopic surgery of repair had a shorter post-operative stay in comparison with 16 % of those who underwent open repair increasing the patient compliance(p-value : 0.007)

TABLE-14 : RECURRENCE RATES ON FOLLOW-UP

Recurrence	LAP	OPEN
YES (3)	0	3
NO (47)	25	22
p value	0.048	Significant



On follow up,it was found that none of the patients who underwent laparoscopic repair had any recurrence whatsoever during the study period.12% of patients who

underwent open repair came back with recurrence further emphasising the efficacy of laparoscopic repair.

SUMMARY

The repair of umbilical hernia is still a challenge to various surgeons around the world. The Mayo's repair could not stand the test of time due to its higher recurrence rate.

Umbilical hernias generally develop from small fascial defects. Because of their size, a common practice is to repair the defect in the open method with primary sutures with the patient under regional anesthesia. Recurrence rates of up to 15% have been associated with this technique to which effect was repair tried with prosthetic materials.

However,the main concern surrounding the use of a prosthetic material for hernia repair is its association with complications, such as wound infections, seromas, mesh extrusion, fistula formation, and adhesions. Infections occur in 15% to 45% of patients following open hernia repair with mesh materials. These infections closely correlate with recurrence rates. Both may be secondary to the larger incision with which the mesh is in contact and the wider soft tissue dissection needed for mesh placement. In the open approach, attaining an overlap of 3 to 5 cm requires extensive soft tissue dissection, with resultant increase in wound complications.

What does Laparoscopic repair offer in this regard?

The Laparoscopic technique for Umbilical hernias and Paraumbilical hernias repairs has resulted in decreased postoperative pain and length of stay, shorter RTNA, and lower recurrence rates..The large surface area of the mesh allows substantial

tissue ingrowth for permanent mesh fixation, and the intraabdominal pressure tends to hold the mesh in place against the underlying structures. The main differences compared with the open technique are the smaller incisions and minimal soft tissue dissection needed for the placement of a large mesh overlap, which decreases the incidence of wound complications.

In the laparoscopic technique, the mesh or autologous tissue graft like fascia lata is placed in an intraperitoneal location and less often in the preperitoneal location, where the rise in the intra-abdominal pressures is totally diffused along each square inch of the mesh and not along a tenuous suture line, as happens in conventional suture repairs. An increase in the intra-abdominal pressures thus helps to keep the mesh in place rather than displace it, as is the case in conventional overlay repairs. The laparoscopic approach affords the surgeon the ability to clearly and definitively define the margins of the hernia defect and to identify additional defects that may not have been clinically apparent preoperatively. One of the key determinants to a high recurrence rate following conventional open repairs is the phenomenon of occult hernias which are effectively circumvented in the laparoscopic approach.

Advantages of Laparoscopic Repair over Open Techniques

1. Earlier RTNA(Return To Normal Activity)
2. Lesser Recurrence rates
3. Lesser incidence of Complications
4. Shorter post-operative stay at hospital
5. Ideal for Larger defects(>3 cm) , recurrent hernias and in obese patients.

CONCLUSION

Laparoscopic repair of umbilical and paraumbilical hernias is a safe and effective technique when compared with the conventional open methods of repair, even in the presence of multiple previous abdominal surgeries and large defects. It also allows for identification of previously undiagnosed secondary hernia defects.

Laparoscopic method of repair clearly supersedes the conventional open method in terms of Early return to normal activities,lesser incidence of pain,sensory disturbances,wound infections and complications along with significantly reduced incidences of recurrences in the long run.

ANNEXURE-I

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ANNEXURE-II

PROFORMA

Name :- I. P. No :

Age :- Case No :

Sex :- D.O.A :

Occupation :- D.O.S :

D.O.D :

Address :-

Phone no :

Presenting Complaints

Past history

Personal history

Treatment history

Family History

GENERAL PHYSICAL EXAMINATION

1. General survey

2. Body build and nourishment

3. Appearance

4. Attitude: Restless/ Quiet

5. Dehydration: Mild/ Moderate/ Severe/ Nil

6. Anaemia/ Jaundice/ Clubbing/ Cyanosis/ Lymphadenopathy/ Pedal oedema

7. Pulse

8. Temperature

9. Respiratory rate

10. Blood pressure

LOCAL EXAMINATION OF
ABDOMEN AND UMBILICAL
REGION

1. INSPECTION
2. PALPATION
3. PERCUSSION
4. AUSCULTATION

SYSTEMIC EXAMINATION

- Cardiovascular system
- Respiratory system
- Central nervous system
- Genito-urinary system

DIAGNOSIS : Umbilical/Paraumbilical Hernia

SURGICAL PROCEDURE :

- OPEN PRIMARY SUTURE REPAIR
- OPEN ONLAY MESH REPAIR
- LAPAROSCOPIC PRIMARY CLOSURE
- LAPAROSCOPIC MESH REPAIR/TISSUE REPAIR

POST-OPERATIVE PERIOD

- Post-operative day of return of bowel sounds
- Post-operative day of starting oral feeds
- Complaints: pain/sensory disturbances/urinary retention/bowel disturbances
- Wound Infection
- Duration of Stay.

FOLLOW UP for Recurrences

ANNEXURE-III MASTERCHART

S.No.	NAME	AGE	SEX	IP NO	DIAGNOSIS	PROCEDURE	POD of return of BS	POD of starting oral feeds	Pain	Sensory disturbances	Bladder/bowel disturbances	Wound infection	POD discharge	Recurrence
1	Alagammal	25	F	1093275	UH	LSR	1	1	4	N	N	N	3	N
2	Muniyasamy	39	M	1093288	PUH	LRWM	1	1	4	Y	Y	N	3	N
3	Karuppaiya	51	M	1093365	PUH	LRWM	1	1	5	N	N	N	3	N
4	Savithri	36	F	1093399	UH	OSR	2	3	7	N	N	Y	9	N
5	Lekshmi	45	F	1100244	PUH	ORWM	3	3	7	Y	Y	N	5	N
6	Karuppasamy	28	M	1100299	UH	LSR	1	2	4	N	N	N	4	N
7	Charles	41	M	1110234	PUH	LRWM	2	3	4	N	N	N	6	N
8	Subbammal	56	F	1110878	UH	OSR	1	1	6	Y	Y	N	4	N
9	Meenatchi	34	F	1110999	PUH	LRWM	2	2	4	N	N	N	4	N
10	Jayakodi	44	F	1111222	PUH	LRWM	1	1	6	N	N	N	4	N
11	Ammathai	65	F	1111299	PUH	LSR	1	1	6	N	N	N	3	N
12	Arun	32	M	1111887	UH	ORWM	3	3	8	Y	Y	Y	12	Y
13	Latha	36	F	1112799	PUH	LRWM	1	2	4	N	N	N	4	N
14	Villammal	65	F	1112997	PUH	OSR	4	5	7	Y	Y	N	8	N
15	Mahalekshmi	40	F	1114440	PUH	LSR	1	1	6	N	N	N	4	N
16	Muneeswaran	48	M	1115007	UH	LRWM	1	1	4	N	N	N	4	N
17	Kaliyammal	38	F	1122465	UH	LSR	1	1	4	N	Y	N	3	N
18	Veluthayee	46	F	1124416	UH	LRWM	1	1	5	N	Y	N	3	N
19	Madasamy	50	M	1124555	UH	ORWM	3	3	5	Y	Y	Y	9	N
20	Velammal	54	F	1134456	PUH	OSR	2	2	8	Y	Y	Y	12	Y
21	Alagasundari	33	F	1144267	PUH	ORWM	2	2	8	N	N	N	6	N
22	Jasmine	34	F	1145578	PUH	LRWM	1	1	3	N	N	N	3	N
23	Senthilnathan	49	M	1145600	PUH	OSR	2	2	9	Y	Y	N	4	N
24	Logambal	56	F	1167899	PUH	ORWM	3	3	7	Y	Y	N	6	N
25	Meenatchiamma	55	F	1177453	PUH	ORWM	4	4	6	N	N	N	7	N
26	Savitha	29	F	1184456	UH	LSR	1	1	6	N	N	N	6	N
27	Sundarammal	43	F	1184987	PUH	LRWM	2	2	4	N	N	N	5	N
28	Lokesh	24	M	1184998	UH	LSR	1	1	3	N	N	N	3	N
29	Karuthammal	37	F	1190111	PUH	OSR	2	2	5	Y	Y	Y	10	N
30	Sathaiya	31	M	1190199	PUH	LSR	1	1	4	N	N	N	3	N
31	Ramya	30	F	1190398	PUH	LRWM	2	2	4	N	N	N	5	N
32	Meenalocini	28	F	1190487	UH	LSR	1	1	4	N	N	N	3	N
33	Subash	40	M	1190555	UH	OSR	3	3	5	Y	Y	N	5	N
34	Eswari	32	F	1191456	PUH	LSR	1	1	3	N	N	N	3	N
35	Alageswari	40	F	1191890	PUH	LRWM	1	1	4	N	N	N	3	N
36	Muthammal	54	F	1191919	PUH	OSR	2	2	6	Y	Y	N	6	N
37	Parvati	22	F	1201006	PUH	LSR	1	1	5	N	N	N	3	N
38	Pakkiyam	47	F	1201098	PUH	ORWM	3	3	5	Y	Y	Y	9	N
39	Meera	26	F	1201365	UH	LSR	1	2	2	N	N	N	6	N
40	Surendran	44	M	1214578	PUH	LRWF	2	2	4	N	N	N	5	N
41	Palanichamy	67	M	1244554	UH	OSR	3	3	5	Y	Y	N	7	N
42	Joseph	50	M	1250678	UH	ORWM	2	2	7	Y	Y	N	6	N
43	Murugan	42	M	1266097	UH	OSR	2	2	8	Y	Y	Y	11	N
44	Arokkiyamary	58	F	1294700	PUH	ORWM	2	2	7	Y	Y	Y	10	N
45	Sreelekshmi	36	F	1300121	PUH	OSR	1	2	6	Y	Y	Y	7	N
46	Raman	20	M	1300199	UH	ORWM	2	2	6	N	N	N	8	N
47	Anitha	31	F	1340002	UH	ORWM	3	3	6	Y	N	N	7	N
48	Rajeswari	40	F	1344076	PUH	ORWM	4	4	5	Y	N	N	8	Y
49	Andisamy	42	M	1344878	PUH	ORWM	3	3	7	Y	Y	N	9	N
50	Valli	51	F	1350043	PUH	ORWM	2	2	6	Y	Y	N	11	N

KEYS TO MASTERCHART

UH- Umbilical Hernia

PUH- Paraumbilical Hernia

OSR- Open Suture Repair

ORWM- Open Repair With Mesh

LSR- Laparoscopic Suture Repair

LRWM- Laparoscopic Repair With Mesh

LRWF- Laparoscopic Repair With Fascia

POD- Post-Operative Day

Y- Yes

N- No

ANNEXURE-IV

ETHICAL COMMITTEE APPROVAL LETTER

MADURAI MEDICAL COLLEGE
MADURAI, TAMILNADU, INDIA -625 020
(Affiliated to The Tamilnadu Dr.MGR Medical University, Chennai, Tamil Nadu)

Prof Dr V Nagaraajan MD MNAMS DM (Neuro) DSc.,(Neurosciences) DSc (Hons)
Professor Emeritus in Neurosciences, Tamil Nadu Govt Dr MGR Medical University
Chairman, IEC

Dr.M.Shanthi, MD.,
Member Secretary,
Professor of Pharmacology,
Madurai Medical College, Madurai.

Members

1. Dr.K.Meenakshisundaram, MD (Physiology)Vice Principal, Madurai Medical College

2. Dr.Sheela Malliga Rani, MD., DA., Medical Superintendent, Govt. Rajaji Hosptial, Maudrai

3.Dr.V.T.Premkumar,MD(General Medicine) Professor & HOD of Medicine, Madurai Medical & Govt. Rajaji Hospital, College, Madurai.

4.Dr.A.Sankaramahalingam, MS.,Professor & H.O.D. Surgery, Madurai Medical College & Govt. Rajaji Hosptial, Madurai.

5.Dr.G.Meenakumari, MD.,(Pathology) Professor & H.O.D of Pathology, Madurai Medical College, Madurai

6.Mrs.Mercy Immaculate Rubalatha, M.A., B.Ed., Social worker, Gandhi Nagar, Madurai

7.Thiru.Pala.Ramasamy, B.A.,B.L., Advocate, Palam Station Road, Sellur.

8.Thiru.P.K.M.Chelliah, B.A., Businessman,21, Jawahar Street, Gandhi Nagar, Madurai.

ETHICS COMMITTEE CERTIFICATE

Name of the Candidate	:	Dr.Joel Danie Mathew
Course	:	PG in MS General Surgery
Period of Study	:	2014-2017
College	:	MADURAI MEDICAL COLLEGE
Research Topic	:	A comparative study of the efficacy and advantages of Laparoscopic Repair of umbilical and Paraumbilical Hernias over conventional open repair.
Ethical Committee as on	:	16.03.2016

The Ethics Committee, Madurai Medical College has decided to inform that your Research proposal is accepted.

Member Secretary Chairman Dean / Convenor

Dean,
Madurai Medical College
Madurai-62 020.

18 MAR 2016

ANNEXURE-V

ANTI-PLAGIARISM CERTIFICATE

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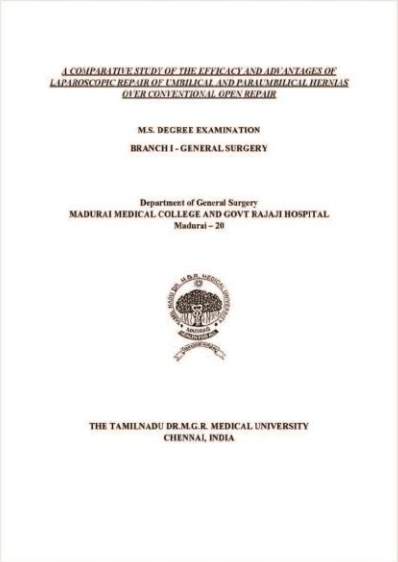

A COMPARATIVE STUDY OF THE EFFICACY AND ADVANTAGES OF LAPAROSCOPIC REPAIR OF UMBILICAL AND PARAUMBILICAL HERNIAS OVER CONVENTIONAL OPEN REPAIR

M.S. DEGREE EXAMINATION

BRANCH I - GENERAL SURGERY

Department of General Surgery
MADURAI MEDICAL COLLEGE AND GOVT RAJAJI HOSPITAL
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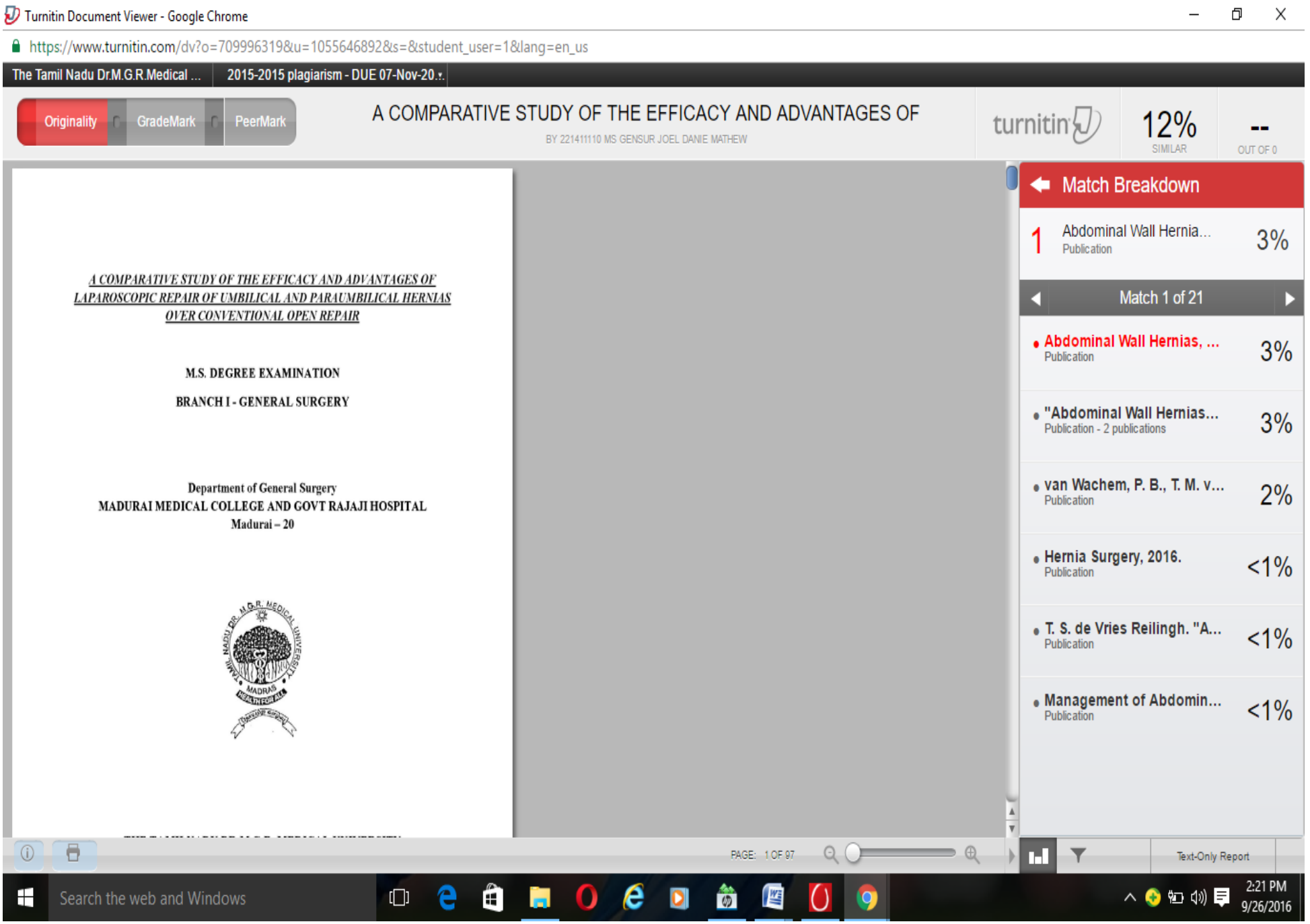
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M.S. DEGREE EXAMINATION
BRANCH I - GENERAL SURGERY
Department of General Surgery
MADURAI MEDICAL COLLEGE AND GOVT RAJAJI HOSPITAL
Madurai – 20
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